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CONTENTS.

ORIGINAL COMMUNICATIONS.

PAGE

W. Blair Bell, B.S., M.D. (Lond.), R. A. Hendry, M.D., B.S. (Lond.), M.B., Ch.B. (Liverpool), and H. E. Annett, *M.B.E.*, M.D., Ch.B. (Vict.). "The Specific Action of Lead on the Chorion Epithelium of the Rabbit, contrasted with the Action of Copper, Thallium and Thorium" - - - - - - - - - - - - 1

Francis J. Browne, M.D. (Aberd.), F.R.C.S. (Edin.). "On the Abnormalities of the Umbilical Cord which may cause Antenatal Death" 17

Leonard P. Lockhart, M.A., M.B., B.Ch. (Cantab.). "Bacteriological Examinations of the Cervix and Vagina during Pregnancy; with special reference to Hæmolytic Streptococci" - - - - - 49

Aldo Castellani, *C.M.G.*, M.D. (Florence), F.R.C.P. (Lond.), and Frank E. Taylor, M.D., B.S. (Lond.), M.A., M.Sc. (Vict.), F.R.C.S. (Eng.), M.R.C.P. (Lond.), D.P.H. "Vaginal Monilias and Vaginal Moniliases" - - - - - - - - - - - 69

William Sharpe, M.D., and A. S. Maclaire, M.D. "Observations of Intracranial Hæmorrhage in 400 Consecutive Newborn Babies" - 79

CRITICAL REVIEW.

Gilbert I. Strachan, M.D., M.R.C.P., F.R.C.S. (Eng, and Ed.). "The Physiology of the Placenta" - - - - - - - - - - - 89

CLINICAL REPORTS - - - - - - - - - - - 112—132

OBITUARY - - - - - - - - - - - - - - 133

BOOK REVIEWS - - - - - - - - - - - - - 137

REVIEW OF CURRENT LITERATURE - - - - - - - - - - 147

REPORTS OF SOCIETIES - - - - - - - - - - - - 182

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The Journal of Obstetrics and Gynæcology of the British Empire

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The Specific Action of Lead on the Chorion Epithelium of the Rabbit, contrasted with the Action of Copper, Thallium, and Thorium.*

By

W. BLAIR BELL, B.S., M.D. (Lond.),

Professor of Gynæcology and Obstetrics in the University of Liverpool;

Gynæcological and Obstetrical Surgeon, Liverpool Royal Infirmary;

R. A. HENDRY, M.D., B.S. (Lond.), M.B., Ch.B. (Liverpool),

Assistant Gynæcological and Obstetrical Surgeon, Liverpool Royal Infirmary;

and

H. E. ANNETT, *M.B.E.*, M.D., Ch.B. (Vict.),

Lecturer, Animal Pathology, Liverpool University.

(From the Department of Gynæcology and Obstetrics, the University of Liverpool).

Received January 15, 1925.

The object of this investigation has been to confirm or modify, as the case might be, the unpublished observations of one of us (W.B.B.), made between the years 1909 and 1914, concerning the specific action of lead on the chorion epithelium.

It had seemed reasonable to attack the problem of the genesis, nature and inhibition of malignant neoplasia by taking as a working hypothesis the idea that the invasion of the maternal tissues by the trophoblast of the fertilized ovum—a process which, if unrestrained, may develop into the most malignant manifestation known—resembles in its mechanism that of cancerous extension[1].

* This investigation was undertaken on behalf of the Liverpool Cancer Research Committee. Director: Professor Blair Bell, of the University of Liverpool.

A further development of this idea led to the conception of the genesis of malignant neoplasia as being a reversion to trophoblastic type on the part of the cells concerned.

" Malignant neoplasia in the human subject, as I see it, is a biological atavism. There is a time in the development of the ovum when somatic cell-correlation and differentiation can hardly be said to exist, except potentially. At that early stage, the trophoblast, of which the ovum is largely composed, is engaged in a struggle for existence: unless it can eat its way into the maternal tissues the whole ovum will perish. The zygote possesses, therefore, the power of developing into cells of two types, the undifferentiated nutritive cells, and the differentiated somatic cells.

" Normally, when satisfactory attachment has been obtained, and the maternal blood vessels have been eroded with dispersion of the circulating blood of the mother among the advancing columns of trophoblastic cells, the area in which the fœtus is to develop grows rapidly, and *pari passu* the activities of the trophoblast, so far as plastic and invasive properties are concerned, are gradually arrested. Thus it appears that, when the elusive factor in somatic cell-correlation becomes operative and ensures normal and differentiated development in the fœtus, the growth of undifferentiated, ' malignant ', epithelium of the chorion is stayed. It is the nature of this controlling factor that we are endeavouring to determine.

" Should the fœtus die and the supply of somatic ' correlating secretion ' cease at a critical time in the period of control, the chorionic epithelium, suddenly relieved of the inhibitory action of this substance, may develop into that most unrestrained and malignant manifestation known as chorion epithelioma.

" The chorion, as I have indicated, has a nutritive function, and to the epithelium is assigned the task of seeking and finding nourishment not only for its own metabolism but also for the correlated and differentiated somatic cells of the embryo, which in turn send a hormone, we may presume, to restrain chorionic activity once a large enough source of food supply has been tapped.

" In view of the method of implantation of the ovum in the human subject, and of the origin of chorion epithelioma, it seems reasonable to suppose that the cells of somatic tissues, formerly normal, may through senility, injury, infection, and the other inciting and predisposing factors of cancer, slowly lose their power of obtaining or utilizing nutriment, and, as the process of starvation is a slow one, adjust themselves to the altered and

altering conditions by reverting to an earlier undifferentiated chorionic, nutriment-seeking type.

"It is probable that every cell in the body has this potentiality of atavistic reversion to the nourishment-providing proclivities normally possessed in a special degree by the chorionic epithelium. Once started on the perverted course, there is no reason why the growth of dedifferentiated somatic cells should be arrested, for like those of chorion epithelioma, they are free of differentiated, somatic control."[2]

It has, therefore, been a matter of importance to demonstrate beyond all doubt: (a) that lead produces abortion by its action on the chorion epithelium; (b) that this action is specific; (c) that other metals and substances investigated have not the same action.

The elucidation of these three points must be preceded by a consideration of the views recorded by others concerning the abortifacient action of lead, and by a summary of the process of normal implantation in the rabbit, the chorion epithelium of which animal is selected for the purpose of study because it is similar in its essential characteristics to the same tissue in Man; and because the animal itself is not unduly sensitive to the poisonous effects of lead, and it is a suitable one for intravenous injection experiments.

Historical.

All writers on lead poisoning from the earliest times have called attention to the occurrence of sterility and abortion both in animals and Man. It is, however, only necessary to refer to this subject in so far as modern writers are concerned; and, moreover, it will be unnecessary in this place to discuss the toxicology of lead generally, as observed by us, for that will form the subject of another communication.

The opinion that lead causes specific abortion by its lethal action on the chorion epithelium had never been advanced previously to our work.

Legge and Goadby[3] maintain that "from what is stated later with regard to the curious action of lead upon the blood, the mechanism of abortion is easily understood; it is probably that placental hæmorrhages are produced as in other organs of the body".

From this statement we gather that no experimental investigation was conducted by these writers. They say: "It is *probable* that placental hæmorrhages are produced". We shall adduce experimental evidence in contradiction of this statement, nevertheless we do not deny that with doses lethal to the pregnant rabbit

hæmorrhages may be found in the uterus, as elsewhere; but we can state definitely that hæmorrhage forms no part of the mechanism of abortion specific to lead.

Oliver[4] observes that " Lead causes abortion probably by acting on the unstriped muscular fibre of the womb and inducing spasm. The poison also passes from the blood of the mother through the placenta to the fœtus *in utero*, and by killing the fœtus it thus indirectly brings about abortion ".

The first portion of this statement is also qualified by the word " probably ". Again no experimental evidence is brought forward to show that lead does induce prolonged spasm of uterine muscle.

Investigations are being conducted by Dr. W. J. Dilling to settle this question. His work will be published in due course. For the present, we can only state that no evidence has been obtained to support the view that abortion is produced as the result of local anæmia caused by protracted spasm of the uterine muscle *in vivo*.

As to the second part of Oliver's statement, we have satisfied ourselves of its truth as applied to the fœtus late in pregnancy when the chorion epithelium has ceased to function, but our observations of implantations earlier in the gestation period show that destruction of the chorion epithelium is the primary process.

It may be mentioned here, as being confirmatory of experimental evidence to be presented directly, that in no form of industrial poisoning, other than that produced by lead, is abortion a recognized phenomenon. It is, however, advisable to add a word of caution lest the effect of lead on the cells of differentiated growth—an effect which is also produced by certain other metals—be considered necessarily analogous to the effect of lead on the chorion epithelium. Moreover, to anticipate criticism on this point, it may be well to call attention to the point that, because certain other metals appear to produce an *effect* on differentiated growth similar to that of lead, it does not follow that the *action* is the same. Further whether the action of metals on differentiated growth be similar or not, it cannot be assumed that the effect or action of any or all is similar to that of lead on undifferentiated tissue, or, indeed, that lead itself acts in the same way on both types of cell—the differentiated and the undifferentiated.

Normal Histological Appearances in the Non-Pregnant and Pregnant Uterus of the Rabbit.

The histological appearances of the uterus of the rabbit in all phases of functional activity have received much attention, especially may we refer to the work of Duval[5] and of Chipman[6], which has been of much assistance to us in our investigations.

UNIV. OF MICH.

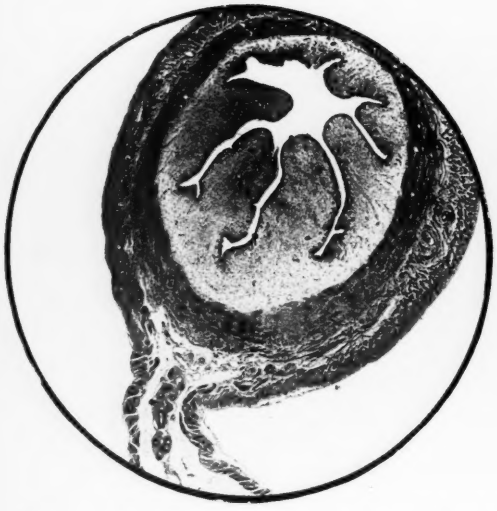


Fig. 1. Section of uterus of the wild rabbit during the mesœstrus, showing the large placental folds at the mesenteric pole, with the periplacental folds on either side, and the obplacental folds at the anti-mesenteric pole. × 15.

Fig. 2. Section of uterus of the domesticated rabbit, showing a papillary disposition of the mucosa. × 15.

Fig. 3. Section of the endometrium of the rabbit, showing the surface epithelium and the formation of glands therefrom. × 120.

Fig. 4. Section of the endometrium of the rabbit during the proœstrus, showing actively secreting glands, and diapedesis of the leukocytes into the lumina. There is some œdema in the stroma. × 200.

The importance of a detailed study of the normal phenomena in connexion with our investigations is twofold: first, it is necessary to be able to state definitely that pregnancy had existed previously to the intravenous injection of lead. In a number of our early experiments, lack of experience, with failure to recognize the significance of certain signs, led to many—probably valuable—results being discarded. Secondly, familiarity with the distinguishing characteristics of the fœtal ectoderm at all stages of development is essential to the recognition of degenerative changes following injections of lead.

Although the actual process of implantation in the rabbit is similar in nature to that occurring in man and other mammals, the histological features associated with intrauterine pregnancy are somewhat different.

The decidual reaction in the maternal tissues of the doe is difficult to define, for, on the one hand, surrounding the vessels at the placental site there is tessellation of the connective tissue, which is commonly held (Chipman[6] and others) to be a decidual reaction; and, on the other hand, the formation in the uterine mucosa, *entirely apart from the placental site*, of what have been described as 'giant cells', resembling decidual cells in the human subject, has led to some confusion.

Again, the epithelium of the chorion in the rabbit shows at first a less definite syncytium than that seen in the human subject. Further, in the doe the chorion epithelium persists to the end of gestation, exhibiting degenerative changes only in the last few days.

Mesœstrous, or resting, period. In a section of the uterus of the wild adult doe during the resting stage between the œstrous periods it will be observed that the disposition of the mucosa is asymmetrical (Fig. 1). Adjacent to, and on either side of, the mesenteric pole of the uterus the mucosa is thrown into folds of large dimensions, which are known as the *placental folds*. Outside these—further from the mesenteric pole—are two other folds, still of large size, but definitely smaller than the placental folds: these are called the *periplacental folds*. On the opposite, antimesenteric, side of the uterine cavity the mucosa is thin and forms small low elevations, described as the *obplacental folds*. It is, however, quite common to find in the domesticated doe an arrangement of the mucosa in the non-pregnant uterus that is much more frondose and indeed papillary, in appearance (Fig. 2). How far this is pathological it is difficult to say, but it is not uncommon to find typical mucous papillomata in the rabbit's uterus.

It seems to us probable that the difference in the appearance of the mucosa of the wild and domesticated animal is to be explained

by the fact that the latter in a warm environment comes on 'heat' with greater frequency, and all the year round, whereas the wild rabbit is subject to a long anœstrous interval. The condition seen in the domesticated doe is, then, due to ovarian stimulation, and is comparable with the hyperplasia of the endometrium seen in Woman.

It will be observed that there is no definite submucous cellular tissue separating the mucosa from the inner circular layer of muscle, which is isolated from the external longitudinal muscular layer by loose areolar tissue. It is unnecessary to describe in further detail the general structure of the rabbit's uterus, for here we are only concerned with the lining membrane.

Examined under a higher magnification the endometrium is seen to be covered with a single layer of columnar ciliated epithelium, which, dipping down, gives rise to numerous tubular glands (Fig. 3). Blood vessels are plentiful, especially at the mesenteric pole.

The Proœstrus. During this stage engorgement of the blood vessels occurs, and there is diapedesis of the leucocytes through the vessel walls into the surrounding tissues, which become œdematous. Some leucocytes pass through the actively-secreting epithelium of the glands (Fig. 4), and escape with the glandular secretion and debris into the cavity of the uterus. Serous exudation, as seen in the human subject, follows, and large lacunæ are formed beneath the surface epithelium. Eventually these lacunæ rupture, and the epithelial cells lining the uterine cavity become detached and escape from the uterus with mucin, serum, and occasionally blood (Fig. 5)[7]. It is interesting to note that a typical decidual reaction may occur in the stroma cells (Fig. 6), and this, when taken in conjunction with 'clearing' of the tissues by exudation, might mislead the inexperienced into the belief that pregnancy was associated with it.

The Oestrus. The proœstrus is followed by the œstrus, during which the animal exhibits sexual desire and accepts the buck. Pregnancy usually follows. If for any reason fertilization does not occur, but coitus or some other mechanical factor, such as what is known as 'doe jumping', causes rupture of the Graafian follicles, and this is followed by the formation of corpora lutea, which we believe to be a *sine-quâ-non,* the condition known as 'pseudo-pregnancy' may arise.

Pseudopregnancy. This state is an interesting one, for lactation and other phenomena usually associated with pregnancy may appear after the œstrus. In this condition the mucosa is said by

Fig. 5. Section of the endometrium of the rabbit during the proœstrus, showing the formation of a lacuna and the separation of the surface epithelium. × 35.

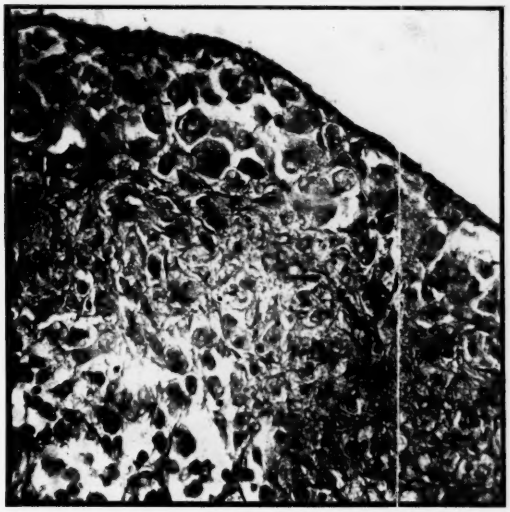


Fig. 6. Section of the endometrium of the rabbit during the proœstrus, showing typical decidual reaction in the stroma cells. × 240.

Fig. 7. Section of the maternal placenta of the rabbit, showing the tessellated ('decidual') appearance of the perivascular connective tissue cells. × 150.

Fig. 8. Section of the maternal placenta of the rabbit, showing the tessellated ('decidual') appearance of the perivascular connective tissue cells, and the extent of this phenomenon. × 100.

Marshall and Halman[8] to undergo " vascularization and extensive glandular development." The mucosa in the illustrations given by these authors resembles in appearance the hyperplastic condition shown in figure 2, and already described. So common is this phenomenon in domestic rabbits that we are disposed to regard it as not peculiar to the pseudopregnant state.

Marshall[9] also states that in the bitch the changes occurring in the sexual organs during pseudopregnancy are in a general way similar to those which take place in true pregnancy, but without being so pronounced.

In our opinion, it would be more accurate to say that some of the appearances of the proœstrus—such as vascularity and œdema—are retained, possibly with overgrowth of a glandular character, but that there are none of the conclusive features of pregnancy, such as ' giant cells', so called and first described by Duval[5].

Pregnancy. The fertilized ovum, as a blastocyst, reaches the uterus on the fourth day after coitus*, and almost invariably becomes centrally attached by the eighth day to the placental folds, to which reference has been made. No doubt this is the site of election because of the better development and blood-supply of the mucosa at the mesenteric pole. Very rarely the ovum is not quite centrally placed and is attached to one or other periplacental lobe, as well as to the placental lobes proper.

During this period the connective tissue cells in the vicinity of the capillaries assume the tessellated appearance already mentioned (Fig. 7), and as this change extends from the walls of the capillaries outwards the whole of the implicated mucous folds becomes chiefly composed of these cells, which have been described by Chipman[6] and others as ' decidual cells ' (Fig. 8). This description, as we have hinted, is open to criticism for, although the line of placental separation passes through the superficial parts, the process of shedding is not a prominent feature; and, furthermore, the histological appearance of these cells differs from that presented by decidual cells in the human subject.

Except for those mononuclear, vesicular cells which are immediately adjacent to the musculature, the so-called ' decidual cells ' become multinuclear and more vacuolated as the fœtal chorion epithelium gradually descends into the maternal tissues. Ultimately, they undergo a form of necrosis and infiltration by fibrin-like material is to be observed.

It would seem that the chief function of these cells is to provide nutriment for the fœtal chorion.

* In this paper the numerical identifications of the period of gestation refer to the number of days after fruitful coitus.

At the antimesenteric pole the obplacental folds have become flattened, and about the ninth day after fruitful coitus numerous giant cells are to be seen (Fig. 9). Chipman[6] states that giant cells appear on the sixth day and persist until the fourteenth. Duval[5] describes their first appearance as being on the tenth day. In our specimens no giant cell has been observed before the ninth day; and they have been noted as late as the twenty-fifth day.

These giant cells resemble very closely human decidual cells. They grow to an enormous size, and may contain more than one round, or oval, nucleus; vacuolation is seen in the cytoplasm late in pregnancy.

The distribution of giant cells is wide, but irregular; they occur usually in clusters, and become less numerous as the mesenteric region is approached. They are, however, seen in the periplacental lobes, but are never found in the placental lobes—that is, beneath the site of fœtal attachment.

The origin of these elements is doubtful. Chipman[6] believes that they arise from the surface or from the glandular epithelium. Duval[5] thinks that they are developed from connective tissue cells. We ourselves have been unable to agree upon the matter.

The significance of giant cells is unknown. Nevertheless, their presence is the most positive indication of gestation of nine or more days duration, and the absence of them conclusive evidence, so far as we know, that pregnancy of this period does not exist, and has not recently been present.

When the epithelium of the blastocyst (trophoblast) comes in contact with the placental folds on the eighth day after coitus, it proliferates rapidly, and, invading the maternal tissues at first along the line of least resistance, penetrates the lumina of the superficial glands, the epithelium of which has undergone hyperplasia to so great an extent that the gland acini are converted into solid plugs of epithelial elements, resembling in the deeper parts masses of syncytium (Fig. 10).

Soon, the maternal epithelium covering the placental lobes is absorbed, and this gives free access to the mesoderm, into which the fœtal ectoderm (trophoblast) makes its way by means of a series of finger-like projections, separated only by blood spaces (Fig. 11). The most advanced processes of the fœtal ectoderm surround the capillaries and replace the perivascular tessellated 'decidual', cells, with the result that the capillaries open into the blood sinuses which are surrounded by the fœtal ectoderm. The arrangement of the fœtal placenta may be likened to that of a honeycomb of which the solid portion represents the fœtal ectoderm, and the honey, maternal blood in the sinuses. The capillaries connect the sinuses with the maternal blood supply. The outline of the projecting

Fig. 9. Section showing the giant cells in the endometrium of the rabbit during pregnancy. × 100.

Fig. 10. Section showing hyperplasia of the glandular epithelium in the maternal placenta in the neighbourhood of the invading chorion epithelium. × 150.

Fig. 11. Section of placental site in the rabbit, showing columns of fœtal ectoderm, separated by large blood spaces, invading the maternal tissues. × 100.

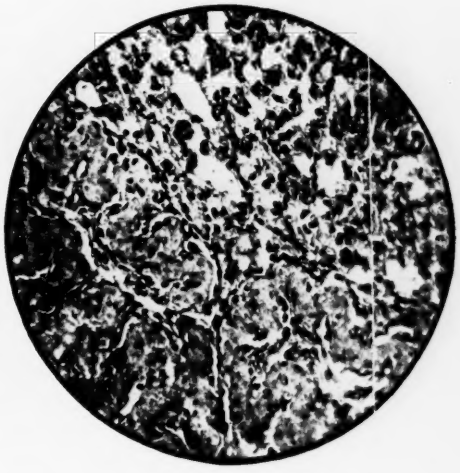


Fig. 12. Section showing coagulation necrosis in the fœtal ectoderm of the rabbit (lower part of the picture), the result of injections of Lead. × 200.

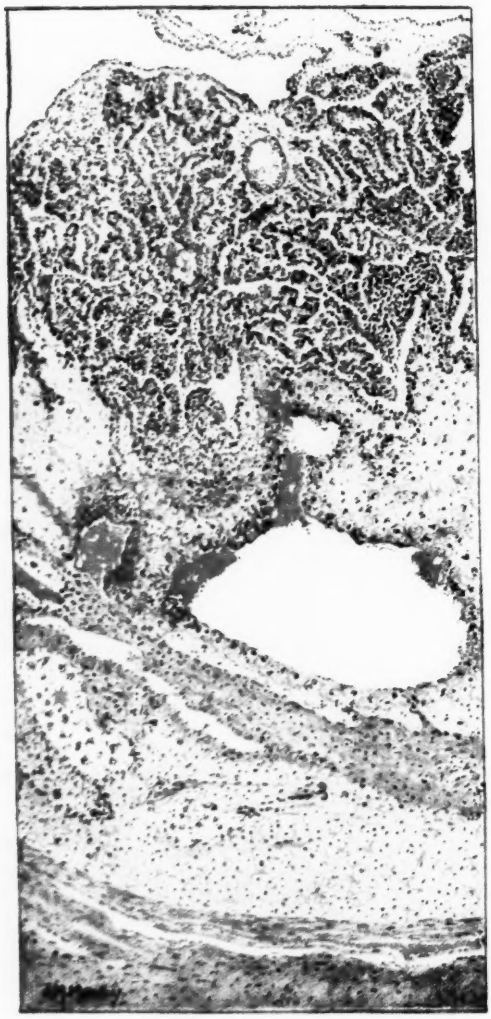


Plate 1.

Normal implantation site in the rabbit on the 17th day of gestation. × 40.

processes of fœtal epithelium is ragged, and not flat (Colour plate 1).

The mesoderm of the fœtus is brought down by the allantois, which penetrates the epithelial projections and vascularizes them.

The further development of the fœtal placenta is merely an elaboration of the simple structure described above.

With regard to the histological appearances of the fœtal ectoderm it may be said that at first the individual cells are well defined and contain single, rounded nuclei. After about the twelfth day the cell boundaries are less clear, and the general appearance is syncytial.

The phenomena, then, of diagnostic value in regard to pregnancy are: (1) an embryo; (2) fœtal ectoderm; (3) giant cells; and (4), of less importance, perivascular, vacuolated, 'decidual', cells.

With regard to the first, it may be mentioned that at the tenth day the embryo is almost invisible to the naked eye, and, unless serial sections be cut, may not be found.

The Effects of Lead on the Pregnant Doe.

We are now in a position to consider that portion of our work which deals with the action of lead on the chorion epithelium, for we have discussed the views of others on the mechanism of lead induced abortion, and we have studied the normal features of the structures and processes with which we are here concerned.

Methods of Investigation. Adult does were used and a large proportion of them were served by two bucks during the period of 'heat'.

All injections were given intravenously.

In the first experiments with a lead suspensoid (colloid), electrically prepared by Professor Lewis and Dr. Corran, pregnant does were taken about the third day after fertilization, and injections were given over a relatively long period. After a further interval of several days the animals were killed and examined.

At that time, the experiments were thought to be negative, for the macroscopical appearances were not considered to be indicative of pregnancy. These cases are not taken into consideration.

When, however, we happened to examine a doe at an earlier period after the cessation of the course of injections, we found a suspicious area in the uterus. Histological examination in the light of further knowledge of the normal processes, enabled us to prove that abortion had recently occurred.

After this experience the dosage was increased, and the animals were killed and examined after a shorter interval.

Results. It was noted that below a certain dosage the production of abortion by lead suspensoid was uncertain. The critical quantity for the initial dose seemed to be in the neighbourhood of 10 c.cm. of a preparation of the strength of 0.1 per cent. of metallic lead, as will be seen from Table II set out below.

All pregnant does that received 12.5 c.cm. of 0.1 per cent. lead suspensoid, or its equivalent, have aborted.

It has not been considered necessary to devote the time and material required for a more exact determination of the minimum initial effective dose in regard to abortion. It lies between 10.0 and 12.5 c.cm. of 0.1 per cent. lead suspensoid; and it is probable that small variations in dosage would be found to accord with differences in the body-weight of the animals concerned.

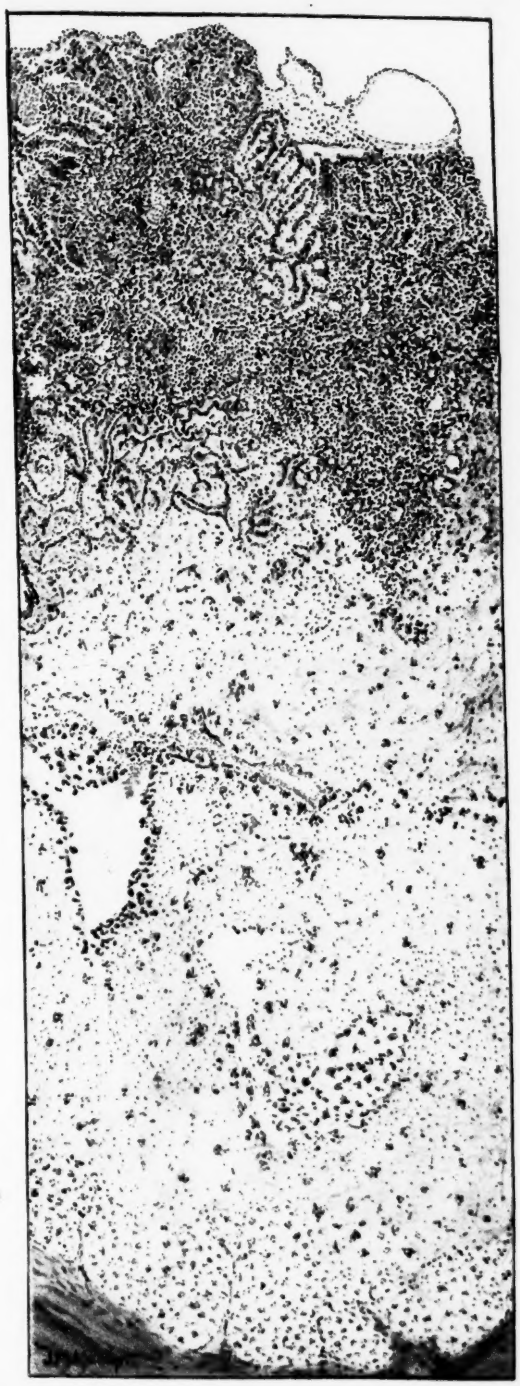
In the experiments performed in order to ascertain the effective abortion dose, a number of does received 12.5 c.cm. or more, of 0.2 per cent. lead suspensoid. Some of the animals died, and some recovered. It appears, therefore, that the lethal dose is approximately double that which inevitably produces abortion.

Pathology of the Effects of Lead on the Pregnant Uterus. The earliest pathological change seen after injection of lead suspensoids is coagulation necrosis in the ectodermal tubules (trophoblast) of the fœtal placenta (Fig. 12 and colour plate 2). Although most marked at the growing edge of the fœtal placenta, the necrosis is not long confined to any one part, but rapidly spreads throughout the fœtal ectoderm, and subsequently into the adjacent superficial tissues of the maternal placenta. In only one specimen is there a clear line of demarcation between the necrotic fœtal and maternal tissues (Fig. 13). As a rule, the boundary is indefinite, but the necrosis is primarily in the fœtal ectoderm. We would emphasize the fact that the maternal placenta is affected later and less extensively than the fœtal placenta.

Further, we are convinced that the vascular changes in the maternal placenta are those associated with the process of thrombosis, and that there is not the slightest evidence of hæmorrhage, apart from that which must occur in every case of abortion (Fig. 14).

The necrotic fœtal placenta is soon cast off, and is sometimes found as a reddish mush in the cavity of the uterus. The fœtal membranes also break up early and disappear. In the specimens in which the embryo is still *in situ*, it is obvious that it is undergoing degenerative changes: the cells are losing their individual boundaries, and the normal semidiagrammatic arrangement of groups of cells is disappearing.

The perivascular, 'decidual', cells in the deepest part of the



Chorion epithelium showing coagulation necrosis (C).

Maternal mucosa showing 'decidual tessellation (D).

Circular muscle-fibres of uterus.

Plate 2.

Implantation site in the rabbit after injections of Lead, showing coagulation necrosis in the chorion epithelium. × 40.

Fig. 13. Section of the rabbit's uterus showing fœtal placenta separated by a line of demarcation from the maternal tissues, subsequently to injections of Lead. × 5.

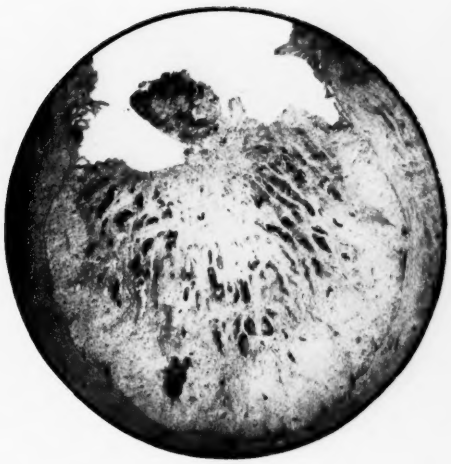


Fig. 14. Section showing thrombosis in the maternal blood-sinuses at the placental site, subsequently to abortion produced by Lead. There is no evidence of haemorrhage. × 9

mucosa remain unaffected; the rest of the maternal placenta becomes necrotic and the vessels thrombosed. It is difficult to demonstrate whether these two changes are simultaneous, or whether one precedes the other, for abortion progresses with great rapidity in the circumstances under consideration.

Except in a few cases, in which relatively enormous doses were used to ascertain the relationship between the effective abortion dose and the average lethal dose, the changes noted in the mother are entirely local. There is no evidence of general poisoning: basophil stippling is not seen in the blood, and no lesion is to be found in the wall of the uterus, in the liver or kidneys.

Rabbits which have not been killed recover rapidly and completely, and behave in all respects—general and reproductive—in a manner similar to that of the controls.

It appears from the findings in these experiments that lead has a selective affinity for the chorion epithelium of the rabbit, and that abortion can be produced by the action of lead on the fœtal ectoderm (trophoblast) without the maternal organism being in any way affected.

The Effects of Copper on the Pregnant Doe.

The effects produced by copper appear to differ from those produced by lead. Whereas the latter seems specially to cause coagulation necrosis in the chorion epithelium, the former produces general toxic effects with hæmorrhage in the uterus.

Methods of Investigation. These were the same as in the case of lead, except for the fact that an ionic preparation was used as well as a suspensoid electrically prepared. These preparations the strength of which was either 0.1 per cent. or 0.05 per cent. of copper, were, as stated, very toxic and only small doses of about 3.0 c.cm. could be employed.

Results. Nine pregnant does were used in all, and of these only five survived. The rest died with acute toxic symptoms, and, postmortem, hæmorrhages were found in the liver, kidneys, uterus and elsewhere.

Specimens were obtained from four of the five survivors. In two of these the gestation sacs were found to be normal on the fourth and sixth days respectively after injection. To one of these rabbits two 3.0 c.cm. doses of the electrically-prepared substance had been given, and to the other three doses of 2.5 c.cm. each of an ionic solution of copper nitrate containing 0.05 per cent. of copper.

In the other two animals abortion was found to be in progress. One was examined four days after it had received two injections of 1.5 and 2.0 c.cm. of the electrically-prepared material. The other

received three injections each of 2.0 c.cm. of the ionic preparation. Both contained 0.1 per cent. of copper.

The fifth survivor littered at the normal time. This one received three injections of 2.0 c.cm. each of the ionic material containing 0.1 per cent. of copper.

Pathology of the effects of Copper on the Pregnant Uterus. In the animals which died as the result of injections of copper, there is intense congestion and hæmorrhage in the *maternal placenta* with consequent atrophy of the fœtal ectoderm (Colour plate 3).

In one rabbit in which abortion was in progress, there is a broad band of hæmorrhage and thrombosis in the deeper parts of the maternal placenta. Two implantation sites examined show differences in degree: in the one in which there is a lesser amount of hæmorrhage the fœtal ectoderm shows but slight alteration from the normal; in the other, the ectoderm is breaking down—disintegrating—over the area where the underlying hæmorrhage is greatest. Clearly in this case the change in the fœtal epithelium is secondary to the hæmorrhage in the maternal placenta.

In the other rabbit in which abortion was in progress the sequence is not so obvious, but hæmorrhage in the maternal placenta has led to necrosis of the fœtal ectoderm. At one spot the change in the epithelium is similar to the coagulation necrosis seen in lead-induced abortion. This is explicable on the ground that the isolation of the fœtal ectoderm by hæmorrhage at this place, was more gradual than that which usually resulted from the toxic effects of copper.

The Effects of Thallium on the Pregnant Doe.

Thallium, when it produces any effect at all, appears to resemble copper very closely in its action on the pregnant uterus, yet it is very much less toxic both generally and locally.

Methods of investigation. For injection a chemically-prepared material, partly ionic, partly colloidal, was used in four cases, and an ionic solution in one. Both prepartions contained 0.1 per cent. of thallium.

Results. In all, five pregnant does received injections. Of these two littered normally at term: the first had received one injection of 20.0 c.cm. of the partly colloidal preparation on the fourth day of pregnancy; while to the second were given three injections each of 12.5 c.cm. of the same material.

From the remaining animals, three in number, specimens were obtained by operation. In one rabbit which had received two injections each of 10.0 c.cm. of the partly colloidal preparation, gestation was progressing normally.

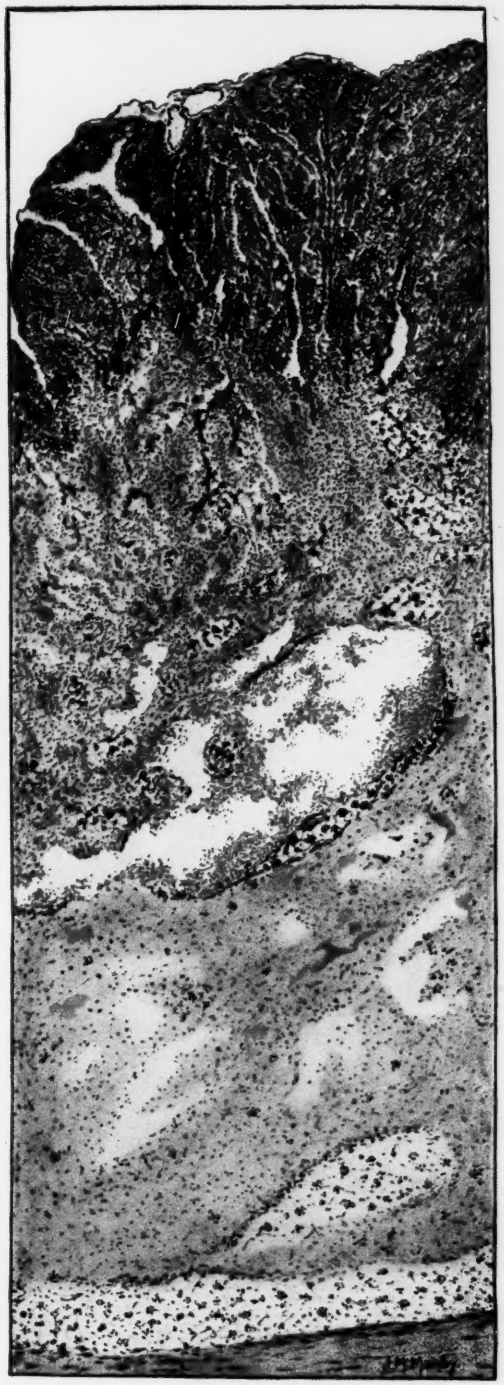


Plate 3.

Implantation site in the rabbit after injections of Copper, showing extensive hæmorrhages in the chorion epithelium. × 40.

In the other two rabbits abortion was found to be in progress. In one case three injections of 12.5 c.cm. each of an ionic solution had been given, and in the other a similar quantity of the partly colloidal material, also given in three equal doses.

Pathology of the effects of Thallium on the Pregnant Uterus. In one sac, in an early stage of abortion, the outstanding feature is the presence of a broad, almost continuous zone of hæmorrhage and necrosis in the deeper parts of the maternal placenta, adjacent to the circular muscular coat of the uterus. The hæmorrhage extends towards the fœtal placenta, the epithelium of which shows here and there areas of necrosis, but the necrosis is obviously different from that seen with lead-induced abortion, for the nuclei of the cells persist and stain well. There can be little doubt that the changes in the fœtal epithelium are secondary to hæmorrhages in the underlying maternal tissues. In the other sac the process of abortion is more advanced, and the fœtal placenta has disappeared. The necrosis in the maternal placenta is widespread.

It may be mentioned that in addition to the pregnant does discussed above, nine other rabbits received injections of thallium preparations. Five were given material that was partly colloidal (chemically-prepared 'colloid') of a strength of 0.1 per cent., in doses varying from 2.0 c.cm. to 20.0 c.cm. Four received injections of ionic thallium chloride of the same strength in doses from 5.0 c.cm. to 25.0 c.cm. No toxic effects were observed.

Effects of Thorium on the Pregnant Doe.

Methods of Investigation. A partly ionic, partly colloidal, chemical preparation containing 0.05 per cent. of thorium as the metanitrobenzoate was used in four cases, for intravenous injections.

Results. Four pregnant does received injections. Two littered at term after (a) two doses of 12.5 c.cm. each on the 14th and 15th days, and (b) two doses of 12.0 c.cm. and 9.0 c.cm. on the 14th and 15th days. Gestation sacs removed at operation on the 21st and 20th days showed in (a) no effect, and in (b) decided congestion and some thrombosis.

The other two animals had each received totals of 35.5 c.cm. in three doses of 12.0, 12.5, and 11.0 c cm. on the 14th, 15th and 16th days respectively. Operation on the 20th and 21st days revealed pregnancy in only one horn in each case. The gestation sacs in one doe were normal; in the other there were five normal sacs with living embryos, and one sac in which a moderately late stage of abortion was found.

Four non-pregnant rabbits received doses of from 5.0 c.cm. to 25.0 c.cm. of a similar preparation without any general ill-effect.

Summary and Conclusions.

It appears from the findings in these experiments:

I. (a) That lead has a selective affinity for the chorion epithelium, and that abortion can be produced by the action of lead on the fœtal ectoderm (trophoblast) without the maternal organism being in any way affected.

(b) That the effective abortion dose of lead is approximately half the lethal dose.

II. (a) That the effects of copper employed in sublethal doses are uncertain: there appears to be no definite quantity which will inevitably produce abortion without damage to the mother. Indeed, a similar dosage may affect neither the doe nor the gestation sac; yet, in other cases it may cause toxic abortion and/or death of the mother.

(b) That abortion following the administration of copper is not due to a specific action on the chorion epithelium. It is the result of hæmorrhage in the uterus. It is probable that the temporary vascularity due to pregnancy renders the uterus susceptible to vascular lesions.

III. (a) That thallium preparations are relatively atoxic.

(b) That the production of abortion by thallium is very uncertain, and that when it does occur it is the result of hæmorrhage in the maternal tissues of the uterus.

IV. (a) That thorium is relatively atoxic.

(b) That it is evident that thorium has no specific effect or toxic action on the chorion epithelium.

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TABLE I.

LEAD SUSPENSOID HAD NO EFFECT ON THE PREGNANT RABBIT.

No.	Initial dose. c.cm. of S_3 at 0.1% Pb.	Initial dose. Gramme of Pb. per kilo body-weight.	Total quantity. c.cm. of S_3 at 0.1% Pb.	Total quantity. Gramme of Pb per kilo body-weight.	Days in pregnancy when injected.	Result.
1.	5.0	0.0020	5.0	0.0020	11th	Kindled normally.
2.	5.0	0.0022	15.0	0.0067	4th, 7th, 11th	Killed. Normal pregnancy.
3.	5.0	0.0027	18.0	0.0097	23rd, 24th, 26th	Kindled normally.
4.	5.0	0.0031	24.0	0.015	8th, 9th, 11th, 15th.	Kindled normally.
5.	6.0	0.0041	21.0	0.0131	2nd, 6th, 9th	Killed. Normal pregnancy.
6.	8.0	0.0027	22.0	0.0075	7th, 8th, 9th	Kindled normally.
7.	8.0	0.0037	22.0	0.0102	7th, 8th, 9th	Kindled normally.

TABLE II.

LEAD SUSPENSOID PRODUCED ABORTION.

No.	Initial dose. c.cm. of S_3 at 0.1% Pb.	Initial dose. Gramme of Pb. per kilo body-weight.	Total quantity. c.cm. of S_3 at 0.1% Pb.	Total quantity. Gramme of Pb. per kilo body-weight.	Days in pregnancy when injected.	Days in pregnancy of examination.	Result.
1.	5.0	0.0034	10.0	0.0068	3rd and 6th	11th	Killed. Abortion.
2.	5.0	0.0024	15.0	0.0072	2nd, 6th and 9th	11th	Killed. Abortion. Macroscopic. evidence only.
3.	5.0	0.0024	18.0	0.0087	8th, 9th and 11th	16th	Killed. Abortion.
4.	6.0	0.0034	21.0	0.0117	2nd, 6th and 9th	13th	Killed. Abortion.
5.	6.0	0.0037	21.0	0.0127	2nd, 6th and 9th	15th	Killed. Abortion.
6.	10.0	0.0046	18.0	0.0084	8th and 9th	10th	Died. Enteritis. Abortion
7.	10.0	0.0037	28.0	0.01	8th, 9th and 10th	14th	Operation. Abortion.
8.	12.25	0.0058	12.25	0.0058	12th	18th	Operation. Abortion.
9.	12.5	0.0063	12.5	0.0063	15th	20th	Operation. Abortion.
10.	12.5	0.0063	12.5	0.0063	13th	19th	Operation. Abortion.
11.	12.5	0.0068	12.5	0.0068	16th	21st	Operation. Abortion.
12.	13.0	0.0053	13.0	0.0053	13th	19th	Operation. Abortion.
13.	20.0	0.0093	20.0	0.0093	8th	9th and 11th	Operations. Abortion.
14.	20.0	0.0077	20.0	0.0077	19th	22nd and 27th	Operations. Abortion.
15.	24.0	0.0123	24.0	0.0123	12th	14th and 21st	Operations. Abortion.
16.	25.0	0.0119	25.0	0.0119	14th	20th	Operation. Abortion.
17.	25.0	0.0111	25.0	0.0111	16th	17th	Died. Acutely toxic.
18.	25.0	0.0119	25.0	0.0119	16th	17th	Died. Acutely toxic.
19.	30.0	0.0113	30.0	0.0113	14th	20th	Operation. Abortion.
20.	30.0	0.0118	30.0	0.0118	14th	18th	Operation. Abortion.

On the Abnormalities of the Umbilical Cord which may cause Antenatal Death.

By

FRANCIS J. BROWNE, M.D. (Aberd.), F.R.C.S. (Edin.),
Assistant Physician, Edinburgh Royal Maternity Hospital.

TRUE KNOTS ON THE CORD.

The occurrence of true knots on the umbilical cord must be looked upon as somewhat rare. According to Von Winckel they are present in 0.4 per cent. to 0.5 per cent. of all births, while Chantreuil states that out of 6,075 deliveries observed in the Hôpital des Cliniques, Paris, seven knots were found, six simple and one double, *i.e.*, about one in 1,000 deliveries. v. Hecker records 31,590 births in which true knots occurred 115 times, or once in 274 cases, and in no case was the child injured. In the great majority of cases in which true knots are present they are comparatively slack and have no effect upon the development or life of the fœtus. Indeed, the opinion has been frequently expressed that they can never be drawn sufficiently tight before labour to obstruct the circulation in the cord and thus be a cause of fœtal death. Baudelocque was one of the chief exponents of this view and stated that in some cases he had found even two knots present and the fœtus alive and as large as usual. In one interesting case which he figures, the cord was three times knotted, one knot being interlaced in the other, and still the child was born alive and healthy. The knot was situated about a foot from the umbilicus and was drawn "as tight as any knot could be in such a case." Baudelocque the younger reported three cases of cord knots in two of which the knots were double and were so tight that they left, at the part of the cord where they were situated, a deep furrow-like depression, and yet the infants were born alive and well. Gardien says "when the umbilical cord is very long, it may become entwined around the child's neck and may even form knots; they can never tighten themselves during the pregnancy sufficiently to cause the death of the fœtus or interfere with its growth."

Chantreuil, on the other hand, thinks that they may be a cause of intrauterine death, and that even though born alive the child may be thin and ill-nourished. Levret says: "One sometimes

finds the umbilical cord knotted in a true knot, it is sometimes twisted so as to be doubled, or it may occasionally be even separated from the placenta; when one of these three circumstances occurs the fœtus usually perishes before term or it is at least much emaciated."

Jacquemier says: "The knots that the fœtus forms in passing through a loop of cord appear rarely to block the circulation. It is, however, possible that the fœtal movements can tighten a knot sufficiently to block the circulation, but it is difficult to bring forward convincing examples of death caused in this way."

Naegele and Grenser state that while knots arising during pregnancy are usually harmless, some facts seem to demonstrate that they may exceptionally block the circulation of the cord and thus cause atrophy and death of the fœtus; "One has often met with these knots on an umbilical cord of fœtuses born macerated, but it will always be uncertain if in these cases the knots were not tightened only after death of the fœtus."

Smellie, describing a case of fœtal death which he attributes to a knot on the cord, says: "If the navel string be long and the quantity of surrounding waters great, the fœtus, while young, may, in swimming, form a noose of the funis through which, should the whole fœtus pass, a knot will be formed on the navel string which, if tightly drawn, will absolutely obstruct the circulation."

Tarnier made a knot on a cord and pulled it as tight as possible, then injected fluid, and always found that the fluid could pass. He found that when the vessels proximal to the knot swelled up with fluid the knot partly untied itself, and he thinks the same would happen by the foetal heart pumping the blood through the umbilical vessels. It was only on putting three knots on the cord as closely together as possible that any resistance was experienced. This, it may be said in passing, appears to be an altogether unjustifiable conclusion, for no statement is given concerning the pressure at which the injection was made or evidence adduced that it was not many times greater than that propelling the blood through the vessels of the cord. Lefour and Oui more recently showed that the slight weight of 25 to 90 grms. attached to the cord sufficed to tighten a slack knot sufficiently to cut off an artificial circulation in the cord. These observations are in accordance with my own findings, which are briefly as follows:—

An umbilical cord was taken an hour after delivery and separated from the placenta. A glass canula was fitted into the vein, while to the other end of the canula was fixed a long rubber tube connected with a mercury manometer.

Through the open end of the tube water was injected by means of a large Record syringe. During the experiments the surface of

the cord was kept well lubricated with vaseline in order that its slippery surface might as nearly as possible resemble that present during intra-uterine life.

It was found that when there was no knot on the cord the fluid passed through it at a pressure of 10 mm. of mercury.

When one slack knot was put on the cord and no weight attached, and the knot not in any way tightened, the fluid passed through at a pressure of 20 mm. Even the slackest knot, therefore, caused some obstruction, and this was made evident by the visible swelling and engorgement of the cord on the proximal side of the knot. Next the strands of cord involved in the knot became engorged and finally the fluid passed, the knot becoming partly opened out at the same time.

When two true knots were formed, one superimposed on the other, the fluid passed at a pressure of 60 mm.

A single true knot was placed in the cord, and a weight of 20 grms. was tied to its distal end. No attempt was made to tighten the knot except by the weight attached to the end. The fluid passed at a pressure of 40 mm.

With a weight of 50 grms. a pressure of 70 mm. was required.

With a weight of 100 grms. a pressure of 100—110 mm. was required.

With a weight of 140 grms., 140—150 mm. was necessary.

With a weight of 160 grms. fluid failed to pass at a pressure of 165—170 mm.

The arterial pressure in the umbilical cord varies from 39.3 to 83.7 mm., while the venous pressure is about 16 mm. (Feldman).

These experiments show that even a slack knot may be sufficient to interfere with, if not completely to obstruct, the cord circulation, but that any pull upon the knot such as might be exerted if the cord were wound around the child's neck or body so as to cause a relative shortening of it, would easily cause sufficient tightening to impede the circulation completely.

Mode of Formation. The chief causes which predispose to the formation of knots appear to be: (1) undue length of the cord; (2) hydramnios; and (3) exaggerated fœtal movements; while by some the occurrence has been attributed to violent movement on the part of the mother (Guterman) followed by tumultous fœtal movements which afterwards immediately and permanently ceased. While abnormal length of the cord appears to predispose, instances are not wanting in which a true knot was found upon an exceedingly short cord. Thus in the case of Collyns the cord was only six inches long and had two knots, the fœtus being almost in contact

with the placenta. In the case of Woets the knotted cord was only 14 inches long. Abundance of liquor amnii will obviously facilitate fœtal movements and thus favour knot formation. Schneider held that the knots cannot be formed by fœtal movements but are pre-existing and of developmental origin. This opinion is not generally held, the usual view being that the fœtus swimming in the liquor amnii passes accidentally through a noose of the cord. If it passes only partially through the noose a coil is formed around the neck or body. If, before passing through the loop, it first passes under the cord and then over the adjacent limb of the noose, or if it first twists itself around the placental end of the cord, a complicated knot is formed. If the loop is double when it passes through, *i.e.*, contains two strands in its whole circumference, a figure of eight knot results. During labour a true knot may result from the fœtus passing through a loop spread out in the lower uterine segment. It is obvious that the formation of a knot leads to some shortening of the cord. This of itself may, if the cord is unduly short to start with, lead to the tightening of the knot by the mere weight or movements of the fœtus, but tightening is more likely to occur if in addition the cord is wound round the neck, body or limbs. The mere movements of the fœtus may then suffice to tighten the knot. In this connection it is of interest to note that in a number of the cases in which death of the fœtus was attributed to a knot on the cord it is recorded that the latter was wound once or twice around the body or neck. It is probable that a slight interference with the circulation produced by a comparatively slack knot may lead to such violent fœtal movements that the knot may be tightened sufficiently to cause complete obstruction.

Van Swieten, quoted by Naegele and Grenser, reports the case of a woman who, in two successive pregnancies, gave birth to a dead fœtus, and each time there was a very tightly drawn knot on the cord.

According to Chantreuil, the formation of knots is most likely to occur between the ninth and twelfth week when the fœtus is small and the movements free owing to the relatively large amount of liquor amnii.

According to Hyrtl, the time of formation of the knot may be in some degree indicated by its situation. Thus, if close to the navel, it was probably formed at an early period of pregnancy. It must be noted, however, as pointed out by Chantreuil, that considering the slippery surface of the cord and the slackness of the knot immediately after its formation, it is not inconceivable that it might slide in one or other direction. This is a fact that may be easily verified by anyone. During the injection experi-

ments detailed above, I found that the engorgement and swelling of the cord from accumulation of fluid behind the knot was frequently sufficient in itself to shift the knot downwards from two to six inches.

Anatomical Changes in the Cord. Here it is necessary to make a distinction between old and recent knots. In the latter, which are usually formed during labour, there are no anatomical changes, excepting possibly some œdema on the fœtal side of the cord. In old knots, on the other hand, in which the knot has been drawn sufficiently tight to obstruct the circulation, there are usually well marked changes which may be described as follows:—

(1) There is marked and permanent grooving of the cord at the site of the knot, by the loops forming it.

(2) At the compressed parts of the knot there is more or less complete disappearance of the jelly of Wharton, and all the portions of the cord entering into the knot may be flat and band-like.

(3) When the knot is undone there is persistent curling of the cord at the part where the knot formerly existed.

(4) The vessels in the knotted part are compressed and their calibre diminished while, as in the case of Holzapfel (*vide infra*), the vessels in the proximal part of the cord may have their walls thickened by increase of the fibrous and muscular tissue due, possibly, to hypertrophy of their coats. In some of the recorded cases, after undoing the knot, the vessels were found to be impervious to injection.

(5) That portion of cord between the fœtus and knot (the proximal part) may be œdematous while the distant part may be thin and pale, as in Holzapfel's case, and the cases of Canivet and Hannay. In Veit's case, on the other hand, and in that of Bonnaire and Schwab, it was the placental end of the cord that appears to have been swollen, while in the last mentioned case the placenta also was œdematous.

(6) In six out of 23 cases which I have collected from the literature it is recorded that the cord was looped round the neck, and in one of these it surrounded it three times; in another it so tightly compressed the soft tissues of the neck against the vertebral column that the fœtus was almost decapitated.

Signs and Symptoms. In most cases the only symptom present is cessation, usually sudden, of the foetal movements. Sometimes this has been preceded by undue activity of the fœtus. When this occurs it is probably to be looked upon as due to gradual asphyxiation of the fœtus from tightening of a knot previously formed and not as the cause of knot formation. It is recorded in nine out of 24 cases tabulated below. In three cases it is specifically stated that the movements ceased gradually. As the cessation of

fœtal movement coincides with fœtal death, the uterus ceases to develop and the abdomen to increase in size. In short, all the signs of fœtal death will gradually become apparent. My own experience of true knots in the case of dead fœtuses is limited to two cases. I have, besides, twice seen true knots on the cords of infants born alive and healthy. In neither of these cases, however, was the knot at all tight.

Case 1. Three-para, aged 31, previous three children alive and healthy, the youngest aged two. The mother had always been healthy and the present pregnancy was normal until three weeks before delivery, when fœtal movements ceased to be felt. Apparently, no other symptoms had been noticed. The patient was confined at her own home, where the fœtus was born before arrival of the nurses. It was a premature macerated fœtus, 1215 grms. in weight and 42 cm. long, and judging from the degree of maceration, had apparently been dead about the period during which no movements had been noticed, *viz.*, three weeks. The liver weighed 33 grms., spleen 1.5 grms., placenta 152 grms., small and pale and showing no hæmorrhage nor pathological infarction; cord 60 cm. long and at the middle showed a simple true knot which was very tightly drawn but easily undone. There was no history leading one to suspect the presence of syphilis. Spirochætes were absent from the fœtal organs, and in the absence of any other demonstrable cause of death it seems probable, although unproven, that the knot was the cause.

Case 2. One-para aged 18, healthy and married over two years; first child alive and well, aged 14 months. The father, also, so far as could be ascertained was healthy. Labour was precipitate at full time, a male child being born alive and well, followed by an acardiac fœtus and the placenta, before arrival of the midwife. The living child had a slight deformity of one thumb which was flail-like on account of congenital absence of the metacarpal bone. The acardiac fœtus was sent to me with the placenta and the above history by Dr. Allan Rutherford, Barrow-in-Furness. The acardiac fœtus was badly macerated (papyraceous), and was represented by two lower limbs of fairly normal appearance, a pelvis, and a badly formed abdomen, to the upper margin of which there was attached a rudimentary upper limb. The umbilicus was represented by a slightly elevated papilla, partly surrounded by a furrow at the lower margin of attachment of the upper extremity; (a full description of the specimen will be found in the Trans. Edin. Obst. Soc. 10th May, 1923.)

The umbilical cord of the acardiac fœtus joined the cord of the other fœtus one inch from its root. There seemed to be an anastomosis between the vein in the cord of the normal fœtus and that of the cord of the acardiac fœtus, in the last inch of common cord.

In the cord of the acardiac fœtus there seemed to be no abnormality on microscopic examination, there being present two arteries and one vein. In the root of the cord, however, and close to the abdomen, there was a sac which contained a few coils of intestine. About one inch distal to this there was a true knot on the cord, very tightly drawn, which may have been the cause of fœtal death. In such a monster as this, however, there is sufficient cause of death present without invoking any other; the most interesting feature in the case is that it is impossible to conceive of such a headless and almost limbless monstrosity indulging in active movements, so that the latter seem to be somewhat discounted as an important cause of the formation of cord knots. The circulation in the acardiac fœtus was probably carried on by means of the heart of the normal fœtus which drove a certain quantity of pure venous blood through the cord of the former to the rudimentary limbs, whence by *vis a tergo* it was returned through the two small umbilical arteries into the common placental circulation. The two placental circulations must, therefore, necessarily have communicated, possibly in the common part of the cord.

Knotted Cords in Monamniotic Twins. Several cases have been recorded in which in monamniotic twins the cords were knotted together or otherwise entangled, usually leading to death of one or both. In Pallin's case, however, the children, which were born at the eighth month with their cords knotted together, lived two and three days respectively. In Lindsay's case the cords were in actual contact at their origin and were twisted around one another and tied in a knot; both twins were dead born and macerated. Jeannin reported a case in which the cords were inserted velamentously into the single placenta 5 cm. apart, and were tied together in a figure 8 double knot sufficiently tight to flatten their substance. In Newman's case the two cords sprang from the centre of the single placenta about one inch apart. Each cord was about 24 inches long, and "about midway between the umbilicus and the placental attachment of the funis the cord of the first child was tied in a single knot, and passing through the noose so formed was the cord of the second child, which, on account of the tightening of the knot, was completely strangulated."

The first child was born alive and well, but the second dead and livid (not macerated), death having apparently occurred during labour. In Weston's case the cord of one twin had passed through a knot on the cord of the other; the latter was then tied so tightly that the circulation in both cords was interrupted and both children killed three weeks before birth.

The cases, 26 in number, of fœtal death due to true knots on the cord which I have been able to collect from the literature are given in the following table:—

Observer.	Source.	Age.	Parity.	Alleged. cause.	Symptoms.	Length of cord.	No. of knots.	Situation of knot.	Variety of knot.	Presentation.	Remarks.
Frank.	*Amer. Journ. Obst.* 1907, 55, 790.	31	1	None. Some excess of liquor amnii.	Cessation of fœtal movements only.	90 cm.	1	30 cm. from placenta.	Simple.	—	—
Wallinger.	*Brit. Med. Journ.*, 1908, ii, 147.	49	13	None.	Child seemed to turn over, then movements ceased.	—	1	9 ins. from umbilicus.	—	Breech.	Knot tied so tight as to stop circulation.
Sankey.	*Lond. Obst. Trans.*, iii, 413.	43	6	None.	Movements grew daily fainter from 6th month.	—	1	Middle.	Simple and single.	—	Knot not very tight—possibly not cause of death.
Passot.	*Rev. Med. et Chir. de Paris*, 1869, T v, 370.	—	—	—	Movements gradually lessened.	110 cm.	2	1 at inferior 1 at the superior third.	Simple	Vertex.	Both knots very tight; umbilical vein could not be injected past the knot.
Woets.	*Ann. de la Soc. Med. Chir. de Bruges*, T iii, 1842.	—	5	—	—	14 ins.	—	Middle	—	—	Tight.
Grieve.	*London and Edin. Monthly Jl.*, 1842, p. 23.	—	—	3 wks. before term seized with labour pains and slight hæmorrhage. Passed off with opium.	—	—	—	Middle.	—	Vertex.	Tight enough to interrupt the circulation.

Observer.	Source.	Age.	Parity.	Alleged. cause.	Symptoms.	Length of cord.	No. of knots.	Situation of knot.	Variety of knot.	Presentation.	Remarks.
Piogey.	*Bull. de la Société Anat. de Paris*, 1852, xxvii, 176.	—	1	—		—	1	Centre.	—	—	On untying it two distinct depressions left.
Hannay.	*Lond. Med. Gazette*, 1841, p. 122.	28	3	Sudden movement of mother. No hydramnios.	Tumultuous motions of fœtus followed by cessation.	—	1	Near centre.	Single.	—	Cord once round neck. Knot tightly drawn. Part of cord knotted only half thickness of the rest; arteries from knot to fœtus injected. Part of cord beyond exsanguine, also placenta.
Smellie.	"Theory and Practice of Midwifery," vol. ii.	—	—	Colic.	None except colic.	—	1	10 hand-breadths along.	—	—	Cord "swelled and livid" and knot tight.
Géry.	*l'Union Méd.*, Series 3, 1876, xxii, 886.	32	2	—	Tumultuous movements of fœtus followed by gradual cessation.	—	1	Junction of umbilical two-thirds with placental one-third.	—	—	Albuminuria; placenta showed apoplectic hæmorrhages.
Augouard.	Ditto.	—	—	—	Cessation of fœtal movements only.	—	1	—	—	Breech.	Tight knot where loops of knot crossed the cord, reduced to one-fifth its normal bulk. The compressed parts appeared fibrous.

Observer.	Source.	Age.	Parity.	Alleged. cause.	Symptoms.	Length of cord.	No. of knots.	Situation of knot.	Variety of knot.	Presentation.	Remarks.
Piogey.	*Bull. de la Soc. Anat. de Paris*, 1852, xxvii, 176.	—	1	—	On coming out of her bath had felt child move very actively. Since then had ceased to move.	—	1	Towards middle.	—	—	Cord exsanguine below but very swollen above. Two deep impressions present at level of knot.
Billi.	*Ann. Universale di Medicina*, 1857, clxi,	24	2	—	—	91 cm.	1	14 ins. from placenta.	—	Breech.	Cord formed two loops round trunk, the 2nd of which showed a true knot. Injections into the vein could not pass knot.
Billi.	Ditto.	38	1	None known.	Fœtal movements became very violent at 6th month, continued so two months, then ceased completely.	26 cm.	1	Middle.	—	Vertex.	Cord looped twice around neck of fœtus; the second showed a tight knot.
Belluzzi.	*Bulletino della Scienca medicha di Bologna*, Serie iv, Vol. xiii, 1860, p. 288.	—	Multip.	—	Violent movements which ceased at end of 8th month.	23 cm.	1	9 ins. from navel.	Simple.	—	Cord around neck and knot tight enough to completely interrupt circulation.

Observer.	Source.	Age.	Parity.	Alleged. cause.	Symptoms.	Length of cord.	No. of knots.	Situation of knot.	Variety of knot.	Presentation.	Remarks.
Canivet.	*Ann. de Gynécol.*, 1875, iv, 268.	38	5	—	—	95 cm.	1	10 cm. from navel.	—	Vertex.	First of twins; second alive and well. Cord three times round neck of fœtus. Between knot and umbilicus cord congested. Permanent grooves in knot and injection of vein failed to pass it.
Weston, E. B.	*Amer. Journ. Obst.*, 1893, xxviii, 144.	—	1	Stooped to lift some heavy object and on rising felt unusual commotion in abdomen but no fœtal movement after.		—	1	—	—	—	Single, tightly drawn knot which completely interrupted the umbilical circulation.
Bonnaire and Schwab.	*l'Obstetrique*, 1905, x, 254.	19	1	—	—	77 cm.	1	—	Old.	—	Hydrocephalic fœtus.
					Between knot and fœtus cord was pale red, between knot and placenta purple and thick. Knot was impossible to untie: jelly of Wharton disappeared. Vessels of cord completely impervious to injection; placenta microscopically is œdematous. No evidence of syphilis in placenta or elsewhere.						
Veit.	*Zeitschr. für Geb. und Gynäkol.*, 1893, xxv, 367.	—	—	—	Movements ceased suddenly 14 days before delivery.	—	1	—	—	—	Single coil of cord round neck plus true knot which rests against anterior surface of neck.
					Knot is tightly drawn and beyond it the cord is congested. Post-mortem examination failed to show any other cause of death.						

Observer.	Source.	Age.	Parity.	Alleged. cause.	Symptoms.	Length of cord.	No. of knots.	Situation of knot.	Variety of knot.	Presentation.	Remarks.
Bartscher.	*Monatsschr. f. Geb.* 1861, p. 364.	—	5	Possibly hydramnios. Cord had very little jelly.	Fœtal movement at end of 7th month got very active, then ceased.	25 ins.	1	—	—	—	Cord always round neck in previous births. Cord twice round neck.
					The knot was difficult to undo and the coils around the neck were drawn so tightly that the child was almost decapitated; the soft parts of the neck were pressed tightly against the vertebral column.						
Holzapfel.	*Zeitschr. für Geb. und Gynäkol.*, Bd. lxxiv, Hft. 1.	24	1	—	Cessation of fœtal movements 2 days before onset of labour.	118 cm.	1	Middle.	—	—	Cord had only one artery and one vein. Fœtal half of cord œdematous; part between knot and placenta thin and pale. In fœtal half of cord vessels had walls thickened partly by œdema and partly by increase of muscular and fibrous tissue.
Crawford.	*Surg., Gyn. and Obstet.*, xxxiv, 546.	44	6	Undue activity of fœtal movements.	Cessation of fœtal movements.	Normal.	4	—	—	—	Cord twice round neck. Child normally developed but macerated.

Observer.	Source.	Age.	Parity.	Alleged. cause.	Symptoms.	Length of cord.	No. of knots.	Situation of knot.	Variety of knot.	Presentation.	Remarks.
Browne, F. J.	Not published.	31	4	None known.	Cessation of movements 3 weeks before delivery.	60 cm.	1	Middle.	Simple.	—	Knot tightly drawn. Fœtus macerated.
Browne, F. J.	*Edin. Obstet. Trans.*, May 10th, 1923.	18	2	None.	None.	—	1	2 ins. from fœtal end.	Simple.	—	Acardiac fœtus. Papyraceus.
Cuthbert.	*Obst. Journ.*, 1874-5, ii.	30	Several previous children.	Long cord.	Abortion.	17 ins.	1	Under coils around neck.	Simple. tight.	—	Fœtus 3½ mons. Cord 2½ times length of fœtus.
Cleveland.	*Obstet. Trans.*, Lond. 1872, xiii.	—	3	—	None.	17 ins.	1	3 ins. from navel.	—	—	3 ins. from umbilicus cord tied in single knot round neck of fœtus and afterwards twisted on itself so as to resemble a noose.

Antenatal Death Due to the Cord Encircling and Compressing the Child's Neck.

It is very rarely indeed that this condition leads to fœtal death except during delivery, but a few cases have been recorded.

In Bartscher's case the woman was pregnant for the fifth time. The previous four children were healthy, but each had been born with the cord around the neck. At the end of the seventh month a very severe pain was complained of in the right lumbar region, and at the same time the fœtal movements became very active. This pain lasted but a few days, and with its cessation fœtal movements also ceased. Next day the mother complained only of a heavy weight in the abdomen, then, ten or twelve days after, she complained of repeated shivering fits and sickness. Delivery occurred at the end of the ninth month and was slow and tedious. The liquor amnii was copious and foul smelling and the fœtus macerated. The cord, 25 inches long, had very little Wharton's jelly and was in some parts ligamentous. It had a true knot and encircled the neck of the child twice, and *so tightly that the soft parts were compressed against the vertebral column.*

Hillairet's case: In this case the history was as follows:

C_1 miscarriage at six months.

C_2 full time healthy girl; cord twice round neck; born asphyxiated, but restored.

C_3 abortion three months.

C_4 female at term; cord once round neck; alive and well.

C_5 boy, full time; cord once round neck.

C_6 4 mos. male fœtus, 9 cm. long. The cord was not inserted in the middle line of the fœtus but somewhat towards the right.

From this point it passed to the right, outwards and backwards, round the child's side, making a deep furrow between the lower ribs and the iliac crest. Thence it crossed the back diagonally, making there also a deep furrow until it reached the highest point of the left scapula, then across the left shoulder and over the anterior surface of the neck, over the right lateral surface, across the back of the neck, and so returned to the left shoulder after having made a complete circle. It continued to coil itself around the neck, and in this way made three complete turns, after which it had all been used up. The constriction had almost completely amputated the head, the constricted part being cone-shaped, the base of the cord being above and the apex below. At the apex the

head was only united to the trunk by a pedicle not more than 1½ mm. across.

Trélat's case: The fœtus had the appearance of an abortion of 3-4 months, length 9-10 cm. The cord, very slender at its origin from the umbilicus, formed a loop which kept the right leg tight against the abdomen and lower part of the thorax. The cord passed thence around the neck two or three times, making a deep trench, and from there it wound itself around the upper part of the trunk three or four times, and fixed the right upper limb, over the wrist of which it passed, the forearm being flexed on the arm. On the left side the cord passed under the axilla. From the illustration accompanying the text the cord appeared tight enough to have arrested the circulation in the neck, for a deep groove is present in the neck and upper part of chest. The fœtus was evidently macerated.

A similar condition was present in Blume's case, reported by Schroeder, the soft parts of the neck being compressed even to the vertebral column by several coils of cord encircling it.

In a case described by Cleeman the cord encircled the neck and left arm three times, the latter being perpendicularly elevated and closely bound by the cord to the side of the head. The fœtus was dead, about the fourth month of development, and the author considered death to be due to the interference with the cerebral circulation caused by the constriction of the neck.

If the cord encircles a limb the circulation in the former may be sufficiently interfered with by the pressure on the limb to cause fœtal death. Such cases, however, seem to end more frequently in partial or complete amputation of the limb, with continued life of the fœtus.

In a case described by Sinkler the pressure of the cord had caused a deep sulcus on the limb, and the consequent compression of the cord had led to the death of the fœtus. This condition would arise when the cord had become wound around the limb at a very early stage of development, and the loop failed to become correspondingly large as the limb increased in girth.

Torsion of the Cord.

Like knots on the cord, this is one of the rare causes of fœtal death. According to Dohrn, the condition was first described by Ruysch in 1691. Probably the best paper on the subject is Chantreuil's monograph, and Dohrn, in 1861, collected 85 cases from the literature. The torsion may affect the entire cord and the number of twists may be very numerous, Dohrn finding 85 on a

cord nine inches long, belonging to a fœtus at the end of the fourth month of pregnancy, and Meckel 95 on a cord four inches long. In a 12 inch cord in my own collection there are 49 twists. Frequently, however, the inch or two of cord close to the umbilicus is alone affected owing, it is said, to the scarcity of the jelly of Wharton at that situation; less often a similar area close to the placenta is involved, or various parts of the cord may be affected even in the one specimen. Again, the inch or so of cord close to the umbilicus may be extremely constricted. Very slight or no torsion of this part may be present, but there may be excessive twisting of the thicker part of the cord as in one of Dohrn's cases. Excessive constriction of the cord at its fœtal end may be the only abnormality present, and twisting be entirely absent.

The Normal Twisting of the Cord: A certain amount of twisting of the cord is, of course, physiological in the human subject, the arteries being twisted around the vein usually from right to left, and its function is probably protective, the firm and incompressible arteries preventing injurious pressure upon the thin walled, deeper lying vein.

Neugebauer found that out of 160 cords, 114 were twisted to the left and 39 to the right, while seven showed no twisting whatever. (By "to the left" is meant that starting from the anterior surface of the cord at the umbilicus, the cord is directed towards the left, thence it passes behind, and from there to the right, and so on until the placenta is reached.) Tarnier, out of 150 cords, found the spiral directed 105 times from right to left and 45 times from left to right. Various explanations of this physiological torsion have been given, probably the most satisfactory being that of John Simpson, who put it down to the fact that the right iliac artery is more the direct continuation of the aorta than the left iliac. The aorta lies, in the dorsal region of the fœtus, parallel to the spinal column and on its left side, but as it approaches the pelvis it curves towards the right with the result that it seems to be continued into the right iliac while the left iliac appears to be a branch, is smaller, and receives a smaller supply of blood. This inequality will be carried into their respective hypogastric branches. "The fœtus floating freely in a fluid readily gives way to the recoil acting on its pelvis, and the right artery, having the greater power of recoil, will determine the direction of the rotatory motion which ensues. Thus, supposing the placenta to be attached to the fundus of the uterus and the fœtus floating with its face towards the placenta, then its rotatory motion will be by its cephalic and pelvic ends passing in succession with regard to the uterus from right to left anteriorly, and from left to right posteriorly. This rotation con-

tinues until the natural rigidity of the vessels offers a sufficient resistance and they cease to yield further."

Allen attributes the twisting to the growth of the arteries being more rapid than that of the veins, so that the former are obliged to take a tortuous course in order to accommodate their increased length.

Mutel, Vermelin and Dombray have recently explained torsion on mechanical principles and point out that a cylinder fixed between two plane surfaces, on or with one of which it is free to turn, can only increase in length by assuming the form of a spiral. The cord they regard as a vascular cylinder contained between two planes situated at a constant distance from each other. These planes are the placenta and the fœtus, and the constant distance is maintained by the tone of the uterine wall and suspension of the fœtus in the liquor amnii.

Causes of Pathological Torsion. Various causes have been invoked from time to time to explain this condition. It is most common in multiparæ which is supposed to indicate that the laxity of the abdomen and the greater size of the uterine cavity allow free fœtal movements and thus predispose to excessive torsion. Boys are more commonly affected than girls, and it is supposed that the former are stronger and more active, and that the active movements are an important cause. In Spiegelberg's figures, of 99 cases reported by various authors there were 60 males and 39 females. According to Chantreuil, the chief predisposing causes are excessive fœtal movements and an abnormally long cord. The last must be considered in relation to the fœtal age as the normal length of the cord at different periods of development is approximately equal to that of the fœtus; in most of the recorded cases the length of the cord considerably exceeded this standard. Spiegelberg states that very active movements of the fœtus are the cause, or the exposure of the body of the mother to violent and prolonged shocks. A similar explanation has been invoked by Noegerath, who has seen three cases of excessive torsion following a violent fall. According to Breit, excessive torsion can only occur when the jelly of Wharton is scanty. Simpson, whose theory of the cause of physiological torsion was quoted above, thought that excessive torsion was due to abnormal action of the heart in inflammatory affections of the fœtus. A more likely explanation would appear to be that it is due to the causes of physiological torsion acting to excess on account of less than normal resistance by a very thin cord to the force that produces the twisting, the thinness of the cord being due to the absence, more or less complete, of the jelly of Wharton and affecting the whole or only part of the cord.

ceased. Six days afterwards a macerated child was born. There were no signs of syphilis in fœtus or placenta, nor could any cause of death be found, until on examining the cord, which was 40 cm. long, it was seen to be divided into two distinct portions. The one towards the placenta was the longer and was bulky in its entire length. The other or fœtal portion 5–6 cm. long, was thin and became more so as it neared the umbilicus. The thick part of the cord was scarcely twisted at all, while the constricted portion was markedly twisted, especially near the umbilicus. Microscopic examination of the twisted thin part showed narrowing of the umbilical arteries and thrombus formation within them as though they had been ligatured. The umbilical vein was normal. According to Dohrn, Braun, Chiari and Spaeth observed 19 cases of this kind which is probably, therefore, the most common variety. In Dohrn's case there was but one twist in the constricted portion, which was close to the navel and about 1 cm. long. The rest of the cord was of medium thickness and was 28 times twisted from right to left. The vessels of the cord were shown by injection to be completely permeable though their lumen was much narrowed. In my own series there is one case in which death was apparently due to a localized constriction of the cord with arterial obliteration. The history was as follows:—

Three para, aet. 27. First child still-born, easy labour, at term. Second full time, alive and well, aged two years. Mother seemed healthy; no evidence of syphilis. Wassermann reaction negative. L.M.P. January 28th. No fœtal movements felt since July 31st, previous to which time pregnancy appeared normal, no movements being felt until August 25th. She was sent by her doctor to hospital, where fœtal death was diagnosed and labour induced on August 29th, a dead fœtus being born next day. The fœtus, a much macerated female, weighed 750 grms., length 34.5 cm. Placenta 250 grms.; decidual surface somewhat fibrous in appearance, and at some parts from this surface areas of gelatinous looking tissue penetrated into the placental substance and sometimes almost reached to the fœtal surface. Here and there was a little sub-amniotic blood clot. On section the placenta looked spongy, but the vessels seemed abnormally thickened and stood out prominently, while microscopically the placenta was very non-vascular but the villi were not enlarged. Here and there were one or two still patent vessels, but the walls of these were very thick so that the lumina were almost obliterated. The appearance was *not* that of a syphilitic placenta. Cord 18 inches long, brown and macerated, but otherwise seemed normal except for a small part at its root (the fœtal end) about $\frac{3}{4}$-inch in length, in which the cord was extremely firm and slender, being only 2–3 mm. in diameter. There

was one twist in the cord at this point. It looked as if the jelly were absent. The hypogastric arteries inside the abdomen appeared to naked eye examination to be normal, and the same applied to sections of the cord taken elsewhere. Microscopically, the arteries in the constricted area were completely obliterated. The vein was still patent but the lumen small. The jelly of Wharton was very fibrous and had not the normal myxomatous appearance. The lumina of the arteries seemed to be occupied by fibrous tissue, which was intimately blended with the vessel walls so that but little trace of the latter remained.

It is difficult in this case to say what was the primary condition. There are two possibilities: (1) that there was a localized fibrosis of the Whartonian jelly which caused pressure obliteration of the arterial lumina. There is, however, no evidence in the microscopic sections that there is a mere *adhesion* of the arterial walls to each other. There is rather a new formation of fibrous tissue inside the arteries, and this makes more likely the second explanation, viz. (2) that the primary condition is an arteritis obliterans with thickening of the tunica intima and tunica adventitia, the latter secondarily involving and leading to fibrosis of the Whartonian jelly surrounding it. In this connexion a case described by Cavasse is of interest. The mother was healthy and in her second pregnancy; the pregnancy was normal until the eighth month when movements ceased to be felt. The fœtal heart was no longer heard and the fœtus was born by the breech 20 days later. The placenta was normal and the cord showed the usual appearances to about a distance of 2 cm. from the umbilicus, at which point it became narrowed to the thickness of a small penholder, and was hard and fibrous and not twisted. On section of the cord, a centimetre from the point where narrowing began, a clot was found in the vein, at first red and soft, then becoming firm, hard and white, and adherent to the wall at the narrowed part but still easily separated. The lumen of the vein at the narrowed part was not more than one-third of that at the normal part. The walls were more thickened and the jelly of Wharton completely absent. The vein, emptied of its clot, was permeable though of small volume. The liver was small, but the other organs were not examined. Cavasse thought the condition a phlebitis and that it had existed for some time before death. There was no specific history nor other circumstance to explain the occurrence. The cord was not twisted nor subjected to pressure, neither had there been any fall or blow on the abdomen. The phlebitis had evidently lasted for some time; the fœtus was of small size, considering its age, so its nutrition was probably interfered with; the fœtal movements were very pronounced during the two or three days preceding their entire cessation.

In my own case it is difficult to dissociate the cord lesion from the obliteration of the vessels in the placenta. The condition is probably an arteritis obliterans of obscure origin affecting the intima and adventitia of the cord vessels as well as those of the placenta. In the case of the former the fibrosis had in all probability spread to and involved the Whartonian jelly and thus caused the area of localized constriction. A similar explanation is probably correct in the case of Cavasse, although here thrombosis set in before the venous lumen was obliterated.

Syphilis of the Cord.

The most frequent histological finding in cord syphilis is round cell infiltration of the walls of the vessels. It affects the wall of the vein more frequently and more intensely than that of the artery. The entire circumference of the wall of the vein may be infiltrated and the jelly of Wharton immediately surrounding, or it may affect chiefly or entirely the outer third. In one of my specimens only one side of the vessel was affected and the other had entirely escaped. The artery may show a similar change, but it is less frequently found than in the vein and is rarely so intense as in the latter. The nuclei of the round cells are usually undergoing karyorrhexis. This inflammatory reaction is sometimes the only change evident, and the vessel wall, whether artery or vein, may show no increase in thickness. Sometimes, however, there is found a marked proliferation of the tunica media which may almost or entirely obliterate the lumen. This, in my experience, is most frequently found in the more virulent cases of syphilis, especially in the cords of fresh infants born prematurely and whose organs contain spirochaetes and show well marked syphilitic changes. In all my cases this thickening is entirely of the tunica media, the inner zone of muscle being œdematous and vacuolated, and the nuclei of the muscle fibres and of the connective tissue cells undergoing karyorrhexis. It is unusual, in my experience, to find intimal thickening, although the latter is the principal change described by some observers.

It is doubtful whether the hypertrophy of the media is due to syphilis or is merely a work hypertrophy consequent upon the endarteritis obliterans in the placental vessels. Probably the latter is the correct explanation. The phlebitis may lead to thrombosis with complete closure of the lumen and consequent death of the fœtus.

Spirochætes in the cord. Grafenberg, in 1909, reported that in 39 spirochæte positive fœtuses he had found the spirochæte in the umbilical cord in every case. Bab found them in only 9.4 per cent., and Mohn in 78 per cent. of spirochæte positive fœtuses. Emmons

found them in one of three spirochæte containing fœtuses, but in none of 27 other cases suggestive of syphilis. He concludes that they are only rarely found in the cords of syphilitic infants, that a large proportion of infants shown to be syphilitic by examination of the placenta, as well as by characteristic post-mortem findings, with spirochætes demonstrable in the liver, failed to reveal spirochætes in the cord after extensive search, and that a negative diagnosis cannot be made by examination of the cord alone. According to Grafenberg, they are much more likely to be found close to the fœtal end, rarely towards the placental end. They are found most often in the walls of the vessels, and especially in that of the vein, chiefly in the media and diminishing in numbers towards the adventitia and the intima. Seldom does one find an isolated spirochæte in the jelly of Wharton. Examination of the fœtal end of the cord may therefore yield valuable confirmatory evidence of the presence of syphilis in the fœtus; indeed, Grafenberg goes so far as to say that spirochætes are always present in the cords of congenital syphilitics, whether fresh or macerated, and that if spirochætes are demonstrable in the cord there are almost always other signs of syphilis in the child, such as pemphigus, hæmorrhagic diathesis etc. It is noteworthy, however, that he failed to demonstrate spirochætes in the cords of eight apparently healthy fœtuses born of syphilitic mothers, three of whom suffered at birth from secondary syphilis. This would seem to be conclusive evidence of the invalidity of his statement that spirochætes are always present in the cords of congenital syphilitics. We know that spirochætes are not always demonstrable in the organs of syphilitic infants, and it therefore seems unreasonable to exclude syphilis because spirochætes are not found in the cord.

I have found spirochætes in the umbilical cord of only one macerated fœtus. The organs were spirochæte positive, but a very careful examination of the placenta proved negative. The organisms were present in fairly large numbers in the tunica intima of the vein but not in the media or adventitia, and so close were they to the lumen that in several instances one end of the organism projected into it. In several cases, examination of the cord of spirochæte containing fœtuses proved negative. I must confess, however, that pieces for examination were taken at random from any part of the cord and not necessarily from the fœtal end, and to this probably can be attributed my frequent failure.

Other Rare Lesions of the Cord.

Absence of the Cord.

Complete absence of the cord is not necessarily incompatible with development of the fœtus to term. An instance of t' is

interesting condition is reported by Stute. The mother was at her fifth confinement, all the other children being normal. The condition was felt on examination during labour and the fœtus was extracted, without the occurrence of hæmorrhage, by traction on the knee. The child was very small, but at full time and alive. On the back there was a cystic swelling, and to the abdomen, the placenta, normal in size, was attached over an area of 4 cm., the centre of attachment being at the umbilicus. There was no vestige of a cord. Another case was recorded by Madame Danthez. The child was born dead and macerated at the eighth month. There were hydrocephalus and exomphalos present, and the vessels of the cord were probably really present and spread out on the surface of the sac.

Localized Varicosities on the Cord.

A varicosity of the umbilical vein with rupture six inches from the placental insertion and consequent death of the fœtus has been described by Pluskal. In de Zomnitz's case the cord was bent into an acute angle at a distance of 15 cm. from its placental insertion. At the extremity of this angle there was a varicosity as large as a hen's egg with a thin and ruptured wall. Dougall (quoted by Chantreuil) has recorded a case of an arterio-venous aneurism the size of a hen's egg, at about two inches from the placental insertion. Its walls were formed by the tunic of the cord, and the pouch contained a dark coloured clot surrounded by layers of fibrin. The fœtus had been dead for a long time, judging from the advanced stage of maceration.

Ulceration of the Cord.

A specimen that was probably unique was that recorded by Jenkins, of hæmorrhage into the amniotic cavity resulting from ulceration of the umbilical vein. He attended the patient in premature labour from albuminuria at the end of the eighth month. On examination, he found the membranes intact, and when they ruptured the liquor discharged was seen to be almost pure blood. The child was dead and very pallid—apparently exsanguinated. He estimated that there was at least a quart of blood in the amniotic cavity. A small perforation was found in the umbilical cord about half an inch from its abdominal insertion. The cord was much narrowed at this point but not twisted. An examination of the affected portion revealed the fact that the jelly of Wharton was absent in one spot of a diameter of one-sixth inch and in the depth of the defective mass there was an opening into the umbilical vein. In the part of the vein surrounding the opening the unstriped muscle of its wall had undergone fatty degeneration, which was the cause of rupture.

Hæmatoma of the Cord.

Several cases of this condition have been reported. In some of the cases, but by no means always, it has led to fœtal death. The hæmatoma arises from rupture of the umbilical vein by trauma (as in Couvelaire's case), torsion, varicosity, or on account of velamentous insertion. The blood contained within the amniotic sheath infiltrates the jelly of Wharton over an area of variable extent, compressing the vein and possibly also the arteries of the cord. The size of the hæmatoma varies. In Stocker's case (*vide infra*) it was the size of a pigeon's egg, in Pluskal's case the size of a hen's egg, in Wolsterdorff's case the cord was as thick as the thigh of the fœtus, and in Ritter's case the swelling was 17 cm. long and measured 64 mm. in its greatest girth. Fœtal death is as a rule not due to the amount of hæmorrhage but to pressure by the clot upon the umbilical vessels, especially the umbilical vein, or to the formation of a coagulum in the lumen of the latter as in Stocker's case, of which the details are as follows:—

Frau F., æt. 22. Married in spring, 1879, and soon thereafter became pregnant. Last menstrual period end of May. The pregnancy was in no way abnormal and morning sickness, at first somewhat severe, was gradually controlled. Towards the 20th week fœtal movements were first observed and continued normal until three days before delivery when they became extremely vigorous and then ceased altogether. On 29th February labour pains started, delivery being accomplished by easy forceps early next morning. The fœtus, a male, was premature, well developed, but dead and slightly macerated, the skull bones being movable, the sutures wide and loose and the epidermis on the scrotum detached in shreds.

On the umbilical cord an interesting condition was found. Near the middle of the otherwise normal cord there was a bluish swelling the size of a pigeon's egg. It lay on the side of the cord and occupied about half its circumference. Examination revealed the following facts:—

(*a*) The umbilical vein was considerably dilated at the site of the swelling so that its lumen could hold a hazel nut.

(*b*) This widened part was filled with a solid but unorganized clot.

(*c*) After removal of this coagulum a lacerated opening was visible in the wall of the vein, large enough to admit the head of a pin. The clot in the dilated vein protruded through this opening and was continuous with a firm coagulum situated under the amniotic sheath of the cord.

(*d*) The cord arteries were permeable but somewhat displaced.

(*e*) The swelling of the cord was due partly to the dilated and obstructed vein and partly to the clot under the amniotic sheath.

In this case the fœtal death was evidently due to obstruction of the vein by the clot, but this is not always fatal, for the obstruction may be incomplete as in Kromer's case in which the circulation was maintained through a chink between the thrombus and the vein wall, or in Wolsterdorff's case in which a smooth circular tunnel allowed the blood to pass through the centre of the clot. In Couvelaire's case the child was born alive and well but the hæmatoma was only formed during labour and after birth of the head. The cord was wound around the child's neck and in slipping it over the head the vein must have been injured. The hæmatoma was a very large one, occupying an extent of 10 cm. and stopping 1 cm. from the umbilicus. The wound in the vein was only 1.5 mm. in diameter and part of the clot infiltrated the wall of the vein, separating the outer from the middle coat. If the fœtus in these cases dies only during labour and is therefore expelled in a fresh condition it may show all the appearances usually associated with asphyxia, such as lividity of the mucous membranes, injection of the conjunctivæ and congestion of the internal organs. This is explained by the back pressure of the blood from the obstruction in the umbilical vein through the placental capillaries and the umbilical arteries, this being no doubt facilitated by the comparatively slight difference between the blood pressure in the umbilical arteries and that in the umbilical vein. A similar condition in the body of the fœtus would arise if the extravasation of blood in the cord obstructed the circulation through all three vessels. The following case recorded by Ritter is of interest from this point of view.

The child was premature, dead not more than an hour before birth, and was the first of healthy parents. The birth had been normal, the cord not being around the neck. The heart sounds had been heard by the medical attendant till within an hour of birth when they were strong and regular. After that they were not sought for and so the exact time at which fœtal death occurred was unknown. On birth of the head the blue discolouration of the lips was evident as well as the swollen and injected conjunctivæ. The cord was 69 cm. long, and in the placental portion there was no pathological change. Beginning 1 cm. from the abdominal wall and extending along the cord for 17 cm. was a large hæmatoma, dark blue in colour, of which the greatest diameter was 38 mm. and the greatest girth 64 mm. The portion of the cord next the placenta showed no pathological change to the naked eye, and microscopically

the umbilical vessels appeared quite normal. On examination of the cord at the site of the hæmatoma the following appearances were observed. There was an extensive hæmorrhage underneath the amniotic sheath distending it and infiltrating the jelly of Wharton. The arteries were contracted and the vein collapsed, but its lumen increased. At the point of greatest widening of the lumen the wall of the vessel was torn through. Microscopically the wall of the vein was infiltrated with blood and the intima absent. There was no deficiency in the elastic tissue nor any evidence of inflammation.

Post-mortem examination of the fœtus showed that the vessels of the cord inside the abdomen were normal, the foramen ovale and ductus Botalii patent, and that the cause of death was asphyxia. Ritter attributes the rupture to a pre-existing varix, and adopts the view of Dohrn that such varices may arise from physiological torsion of the cord which kinks the thin-walled vein and thus leads to dilatation behind the kink.

A Rare Abnormality of the Vessels of the Cord.

Microscopic examination of the cord of a premature infant which came under my observation revealed the following probably unique condition of matters. There was but one artery, and instead of a vein, there were numerous capillaries and a few vessels with a little fibrous stroma in their walls scattered throughout the jelly. The jelly of Wharton was much denser than usual and, indeed, was a fairly dense stroma in which the vessels lay embedded. Here and there the capillaries had ruptured and blood in small quantities was effused into the stroma. The infant was born prematurely at the sixth month alive and well formed, but died in a few hours. There was nothing in the history or post-mortem findings suggestive of syphilis.

Cysts of the Umbilical Cord.

According to Haas cysts of the cord may arise from :—

(1) The allantois. Haas, writing in 1906, could find only two cases recorded in the literature, *viz.*, those of Ahlfeld (*Arch. f. Gyn.*, Bd. 10) and Ruge (*Zeitschrift. f. Geb. u. Gyn.*, Bd. 1).

(2) The umbilical vesicle.

(3) The jelly of Wharton, either (*a*) from liquefaction of a hæmatoma, but no case of cyst formation from this cause has yet been demonstrated; (*b*) from liquefaction of the jelly of Wharton itself. Of this many cases have been described (Scanzoni, Hass, Ruysch and Heyfelder). Those arising from the allantois and from the umbilical vesicle have an epithelial lining and are therefore true cysts, but those arising from the jelly of Wharton cannot be so described.

(4) Inclusions of amniotic epithelium.

Cysts of the cord are usually very small, the largest described being about the size of a hen's egg. The smaller ones are of no clinical importance, but it is possible that a large cyst might cause death of the fœtus through compression of the umbilical vein. The only recorded case of fœtal death was that recorded by Scanzoni (quoted by Hass). The cyst was the size of a hen's egg and apparently arose from liquefaction of the jelly of Wharton.

Solid Tumours of the Cord.

Only eight cases of this rare condition appear to have been so far recorded in the literature.

(1) The first case was described by Maunoir in 1820. The child had a hernia into the umbilical cord which was crowned by a strawberry-sized fungating tumour. He removed it with complete success at the age of seven months.

(2) In Lawton's case, a tumour the size of a pear, was situated in the base of a hernia of the umbilical cord and had a telangiectatic structure, but neither this nor Maunoir's case appears to have been histologically investigated.

(3) Gerdes' case, in a child a few hours old. It was four inches long, as thick as a forefinger and shaped like a cow's horn. It entered the navel with the cord and on its base were several smaller protuberances. At birth it was bright red, fairly firm, without pulsation, not diminishable in size by compression, was very smooth and vascular and had a covering of pavement epithelium. It was removed successfully at the eighth day of the child's life. Virchow described it as a telangiectatic myxosarcoma.

(4) The fourth case was examined by Kaufman and reported by him in Virchow's Archiv. Bd. 121. S. 513.

It was removed by Lissner in Posen in 1890. The tumour measured 16 × 6 cm. Underneath it was covered by the outer sheath of the cord, above a mantle-like membrane, obviously the amnion, which passed over the cord, while the cord ran alongside of and was incorporated in the tumour. Removal was successful. This tumour also was a telangiectatic myxosarcoma.

(5) v. Winckel's case. The child was born alive and at term, and was fairly well nourished. At birth was noticed an irregular bright red tumour of moderately firm consistence growing from the side of the cord close to its root. The tumour was 4 cm. long, 2.8 cm. thick at its base, and near its apex 1.6 cm. It was removed by the cautery on the day after birth and the infant did well at the time but died of catarrhal pneumonia 20 days later, the latter being quite unconnected with the tumour or the operation. The tumour was a telangiectatic myxosarcoma with large numbers of new

vessels and also of lymphatics—very dilated and lined by a rapidly proliferating epithelium.

(6) Herweg's case. This differs from all the others in that it was situated close to the placenta. It was a solid tumour with four smaller projections from the main mass. One of these was large and broad based, while three were globular and bladder like. The largest bladder was the size of a cherry, the second of a cherry stone, the third of a hemp seed. The main tumour was kidney shaped and on section its consistence and appearance resembled a fibromyoma. Length 5 cm., height 3.3 cm., breadth 3.2 cm. Section of the tumour showed calcified areas and obliquely cut vessels. Microscopically, the outer part of the tumour was formed of a non-vascular jelly-like ground substance pervaded by numerous firm wavy bundles of connective tissue fibrils and here and there spindle, rod and star shaped cells with oval nuclei. This was probably the normal jelly of Wharton stretched over the surface of the tumour. The true tumour mass lay inside this covering, and was formed of ground substance like that of the latter, but was pervaded by very numerous vessels, all of which were lined by endothelium. The vessels anastomosed freely with one another and had narrow lumina. Surrounding the endothelium and forming the vessel walls were muscle cells arranged in one, two, three or more layers. Some of the vessels, however, had only an endothelial wall. The tumour was described by Herweg as a myxangioma. The origin of the vessels contained in the tumour was, according to Herweg, as follows: A short distance on the fœtal side of the tumour one of the cord arteries gave off a small branch which ran separately to the placenta; this in turn gave off a small branch which divided and re-divided in the tumour. The child was born alive and well at full time.

(7) *Case of Budin.* Fourth pregnancy. First three labours normal; present labour also normal; the child, a well nourished female, was also alive and well. The tumour, which was the size of a large adult fist (8 × 6 cm.), was situated 20 cm. from the umbilicus, surface smooth but bossed. Colour dirty greenish yellow. Its interior showed three distinct cavities, the first of which contained chocolate-like material, the second material like white of egg, and the third a creamy substance resembling vernix caseosa. The umbilical cord was incorporated in the border of the tumour and contained the usual number of vessels none of which communicated with the cyst cavities. On the inner wall of one of the pouches there were several small projections of variable shape and size. The walls of the cavities were lined by pavement epithelium like that of the skin, and beneath this there was a connective tissue layer with numerous sebaceous and sweat glands

and hair follicles. In the second cavity, alongside of areas of dermoid type, there were other parts showing villi like those of the intestine, and covered by columnar epithelium. More deeply there were large numbers of tubular and mucous glands and smooth muscle fibres cut in various directions. The third cavity was lined by columnar ciliated epithelium. In the solid parts of the tumour, beside adipose tissue and smooth muscle fibres, there were large vessels, nerves, and nodules of cartilage and bone. The tumour was thus a teratoma.

(8) Windle (*Jl. Anat. and Physiol.*, 1891, Vol. xxv, p.441) reports a dermoid in the cord of an anencephalic fœtus. The case was originally reported by Kaufmann (Virchow's Archiv Bd. cxxii, hft. 2, S. 381). The tumour was of firm consistence and almost spherical in shape measuring 16 cm. in diameter. It was attached to the cord close to the abdomen, to which its base was connected. Microscopic examination of the tumour showed that it consisted in part of numerous branching and partially cavernous vessels, and in part of myxomatous and embryonic tissue, the author describing it as a myxosarcoma telangiectodes.

Summary.

1. *True knots* may exist on the umbilical cord during intra-uterine life without endangering the life of the fœtus. They, however, sometimes obstruct the cord circulation sufficiently to cause fœtal death.

2. When knots have existed before the onset of labour they show certain anatomical peculiarities which serve to distinguish them from knots formed during labour.

3. *Encirclement of the child's neck by loops of cord* may cause antenatal death. In such cases the soft parts may be so compressed against the vertebral column that the fœtal head may be almost amputated.

4. *Excessive torsion of the cord* is a rare cause of fœtal death. The causes of physiological and pathological torsion are discussed, and it is concluded that an important cause predisposing to excessive torsion is insufficiency of the Whartonian jelly. The cord vessels in these cases are usually impervious.

5. *Localised constriction of the cord* is another not infrequent cause of fœtal death; it is most common in the fœtal end of the cord close to the navel, but may affect several portions of the cord or rarely the placental end alone. It is probable that the cause is an obliterating endarteritis, affecting the intima and adventitia of the vessels, the fibrosis spreading to the jelly of Wharton.

6. *Syphilis of the cord:* The histology of the cord in this condition is discussed; the chief change is round cell infiltration of the

wall of the vein, and proliferation, with vacuolation of the muscle cells and œdema, of the tunica media. Phlebitis with thrombosis may also occur. Spirochætes are most frequently to be found at the fœtal end, and chiefly in the vein wall.

7. Hæmatoma of the cord may sometimes lead to fœtal death. The hæmatoma is due to rupture of the vein from varicosity, torsion of the cord, or injury during labour.

8. Details are given of eight cases of *solid tumour of the cord.* In three cases the structure was that of a telangiectatic myxosarcoma, in two it was a teratoma, in one a myxangioma, while in two others histological investigation was not carried out.

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Bacteriological Examinations of the Cervix and Vagina during Pregnancy; with special reference to Hæmolytic Streptococci.

By LEONARD P. LOCKHART, M.A., M.B., B.Ch. (Cantab.),
(From the Department of Bacteriology, St. Thomas's Hospital.)

THE investigation which is described in this paper was designed with the object of obtaining information with regard to the occurrence of streptococci in cases of normal pregnancies and also in relation to puerperal fever.

The chief points on which information was sought were as follows:—

(1). What proportion of pregnant women harbour streptococci in the genital passages before labour and before any medical examination is performed?

(2). What proportion acquire streptococci after labour has taken place?

(3). What proportion of cases subsequently develop pyrexia during the puerperium; (a) among those women who are found to have streptococci present before labour, and (b) among those in whose genital passages streptococci are not found until later, if at all?

(4). The relative importance of hæmolytic and non-hæmolytic streptococci in relation to puerperal fever.

The definition taken of pyrexia in this paper is a temperature of 100°F. or over on three or more consecutive days. Lower and more transient temperatures have been classed as very slight and all but disregarded.

TECHNIQUE.

The method employed in this investigation was as follows. Examinations were made on each one of a series of one hundred consecutive admissions to the lying-in ward of St. Thomas's Hospital, which accommodates 20 patients at a time.

An examination was made immediately the patient arrived in the receiving room, another examination as soon as possible after delivery, and a third one was made during the puerperium if, and when, the temperature rose above 99° F.

Each examination consisted of the insertion into the vagina of a sterile speculum through which a swab was taken from the external os. This swab was immediately smeared over the surface of a slope of human blood agar, and was then dipped into a tube of serum broth. The speculum was then withdrawn slightly and a similar examination was made of the lateral wall of the vagina, the swab being treated in all respects like that taken from the external os.

The culture tubes were then incubated at 37°C. for 18 hours. Notwithstanding the difficulties of taking many of these swabs the number of contaminations was very small indeed.

Each morning the cultures taken the previous day were examined, and films made from the broth cultures were stained and microscoped. Organisms forming hæmolytic colonies on the blood agar slopes were subcultured on to ordinary nutrient agar slopes and a blood agar plate was inoculated from the corresponding tube of serum broth. Additional to the study of hæmolytic streptococci a number of non-hæmolytic strains were isolated and examined during the course of this research.

The serum broth cultures from any patient developing a temperature above 99°F. were always plated out on to blood agar, no matter whether streptococci had been seen in the stained film or not.

A bacteriological examination of the urine, milk and fæces was also a routine procedure with any patient showing a tendency to pyrexia.

The blood agar used consisted of ordinary nutrient agar to which was added 10 per cent. of whole oxalated human blood when the temperature of the agar, which had previously been melted, had fallen to 45°C. The serum broth consisted of nutrient beef broth to which 50 per cent. of sterile human blood serum was added at ordinary room temperature.

Prior to the adoption of beef broth + serum, "Lemco" broth and dextrose had been tried, but owing to the great production of acid due to the fermentation of the dextrose the streptococci were killed. Plate cultures made from the dextrose medium were often devoid of streptococcal colonies notwithstanding the fact that these organisms were present in the stained film.

Results of the Investigation.

The series of 100 cases consisted of 81 primiparæ and 19 multiparæ. Thirty-eight of the former harboured streptococci in the genital passages when admitted to the ward, while of the latter, 10 harboured these organisms; *i.e.*, 46.9 per cent. in the cases of primiparæ and 52.6 per cent. in the case of multiparæ. Six of the

38 primiparae developed pyrexia, while of the 10 multiparæ three did so. Thus of the 10 cases which developed pyrexia nine had harboured streptococci in the vagina or in the cervix when the patients were admitted to the ward.

Mention should be made here of the fact that whereas the admission of primiparæ was free and unrestricted, that of multiparæ was confined to cases with a bad obstetrical history in former pregnancies and to cases diagnosed in the ante-natal clinic as likely to be difficult.

The streptococci isolated at the first examination (before labour) were found to be hæmolytic in only one case; they were found to be hæmolytic at the second examination (after labour) in another case, but in the other four cases from which hæmolytic streptococci were isolated they were found only when the third culture was taken immediately the temperature began to rise, and were then present in abundance.

The results obtained in the general investigation are tabulated below.

TABLE 1.

Gravid Women
100

Primiparæ, 81=81%.				Multiparæ. 19=19%.			
On admission to ward.				On admission to ward.			
Infected. 38=46.9%		Non-infected. 43=53.1%		Infected. 10=52.6%		Non-infected. 9=47.4%	
(*a*) Pyrexia.		(*b*) Pyrexia.		(*c*) Pyrexia		(*d*) Pyrexia.	
+	−	+	−	+	−	+	−
6.	32.	1.	42.	3.	7.	0.	9.
15.8%	84.2%	2.3%	97.7%	30.0%	70.0%	0.0%	100.0%

TABLE 2.

100 cases.

Normal labour. 54 cases.		Abnormal labour. *i.e.*, instruments, injury or long second stage. 46 cases.	
cum pyrexia	3=5.5%	cum pyrexia	7=15.2%
„ slight fever ...	4=7.4%	„ slight fever .	4=8.7%
„ nil	47=87.1%	„ nil	35=76.1%
Infected on admission	46.3%	Infected on admission	52.1%

TABLE 3.

1st examination. 48 cases showed streptococci.
9 = 18.7% developed definite pyrexia.
4 = 8.3% developed slight temperature.
35 = 73.0% nil.

1st examination. 52 cases showed no streptococci.
1 = 1.9% developed definite pyrexia.
4 = 7.7% developed slight temperature.
47 = 90.4% nil.

1st and 2nd examination. 61 cases showed streptococci.
9 = 14.7% developed definite pyrexia.
7 = 11.4% developed slight temperature.
47 = 73.9% nil.

1st and 2nd examination. 39 cases showed no streptococci.
1 = 2.5% developed definite pyrexia.
1 = 2.5% developed slight temperature.
37 = 95.0% nil.

TABLE 4.

Index.

A. Streptococci present before labour + abnormal labour (as in Table 2).
B. Streptococci present before labour + normal labour (as in Table 2).
C. Streptococci absent before labour + abnormal labour (as in Table 2).
D. Streptococci absent before labour + normal labour (as in Table 2).

Groups as indexed.	Definite pyrexia.	Slight fever.	Nil.
A.	7 = 23.3%	4 = 13.3%	19 = 63.4%
B.	2 = 6.4%	3 = 9.7%	26 = 83.9%
C.	0 = 0%	0 = 0%	15 = 100%
D.	1 = 4.2%	1 = 4.2%	22 = 91.6%

The actual statistical value of the figures given in the above tables is dealt with in Appendix C. The result of certain statistical tests is that the writer feels justified in drawing conclusions from these figures. A larger series might no doubt have rendered certain modifications necessary, but it is in a high degree improbable that any of the conclusions reached would have been reversed on account of dealing with larger samples of the cases under review.

Discussion on the General Investigation.

The percentage of puerperal infection in this series of cases approximates very closely to the figures given by Franke (1923) as the result of the work on 23,000 cases; namely 10 per cent. in this series and 10.1 per cent. in that of Franke. In both cases vaginal examinations were a routine procedure prior to the commencement of labour.

E. Eno (1923) gives his infection rate as 8.6 per cent. in hospital and 2 per cent. among the "extern" patients. This great difference between the two groups of patients is emphasized by many other authorities. An explanation of this which is often brought forward is that in hospital wards there exist those conditions which favour epidemic spread; namely, a carrier of a virulent organism, in this case the streptococcus, and a highly susceptible population in close contact attended by the same nurses and using the same utensils. This carrier theory does not seem to be supported by the evidence in this investigation, for out of 100 cases comprising the series 48 were already infected with streptococci on admission to the ward and of these nine (18.7 per cent.) developed pyrexia. Fifty-two women were not found to be infected on admission and of these only one (1.9 per cent.) developed puerperal fever.

These facts suggest that as regards infection, at or about the time of labour, the cause is intrinsic rather than extrinsic. Had infection taken place in the ward or had the patients been infected by attendants at labour the incidence rate would have been more equally divided between the two groups of patients.

An attempt was made to discover some relationship in time and space between one case of pyrexia and another in this series, but no definite connection could be established, and with the possible exception of case No. 10, the incidence appeared to be quite sporadic.

The results of this investigation tabulated above suggest that abnormality in labour greatly increases the risk of puerperal fever, particularly when such abnormality is associated with infection by streptococci prior to delivery. This is emphasized by the fact that of each class (normal and abnormal) approximately half, 46.3 per cent. and 52.1 per cent., were infected with streptococci on admission to hospital.

26.9 per cent. of the patients who were free from infection on admission were discovered to harbour streptococci at a subsequent examination, but among these there was only one case of pyrexia, namely case No. 10, which was the single possible example of ward infection.

A hypothesis which seems to be justifiable is that if one could

eliminate the streptococci from the patient's genital mucosa prior to the onset of labour one would be a great distance along the road towards the eradication of puerperal fever. Short of attaining the real goal the conclusion that one draws is that when manipulation is required in a patient known to be infected with streptococci the very greatest care is necessary and only the very minimum of interference is indicated.

Antiseptics, particularly when applied as vaginal douches, seem to be not only useless, but at times positively dangerous as a means of disinfecting the genital canal, so that this field remains open for a great deal of research work. Cumberbatch (1923), working with the diathermy, seems to have obtained some hopeful results in dealing with gonococci in cases of chronic cervicitis. The method might be applicable to streptococci but this is extremely doubtful since the latter would need a much higher temperature applied for a longer period than do the gonococci, which are killed by an application of 45° C. for 37 minutes. The application of the diathermy to a pregnant woman nearly at term might be open to grave objections from various points of view.

The difference between the incidence rates of puerperal fever in hospitals and among "extern" cases is somewhat difficult to explain, but it seems that there may be three possible causes, although no doubt many factors enter into the question which are still obscure.

(1) Hospital cases are more often than not primiparæ and specially selected multiparæ, the latter selection being made on account of a bad obstetrical history in previous confinements or on account of an antenatal diagnosis of possible difficulty in the existing pregnancy, and these women who have suffered injury or much manipulation in the past may still harbour streptococci which have remained dormant since the previous labour.

(2) Primiparæ on the whole are more liable to puerperal fever than multiparæ, the possible reason being that in first labour there is much more tissue resistance to the passage of the fœtal head and consequently more maternal damage. The organisms that may happen to be present in the genital canal have therefore a far greater chance of invading the blood stream of a primipara than of a multipara, in whose passages the child moves comparatively freely. Hence the dose of organisms in the former case is far greater.

(3) The third cause one would suggest, though no doubt a slight one, is that a certain proportion of cases of pyrexia among "extern" patients goes unrecorded, for which omission there are many reasons, if few excuses.

The provision of lying-in wards and hospitals has undoubtedly caused a great reduction in the number of obstetrical casualties, and

the apparently contradictory figures do not do these institutions justice. It is unreasonable to expect a delivery to be as surgically clean and hygienic when it is conducted under the conditions prevalent in the homes of the " extern," as when it is carried out in the properly staffed and equipped hospital. The efficiency of the hospital as regards this type of case depends entirely on whether there are adequate arrangements for the immediate isolation of patients should they develop pyrexia during the puerperium.

The organism responsible for the pyrexia of the puerperium is, in the vast majority of cases, a streptococcus either hæmolytic or non-hæmolytic. The figures in this series seem to confirm the general opinion that puerperal fever, at least in its more severe forms, is an infection with the hæmolytic variety.

Kanter and Pilot (1924) have examined 96 cases of pregnancy by clinical and bacteriological methods and they have drawn the following conclusions from their results. They claim to show that the normal vagina rarely contains hæmolytic streptococci, and that there is no evidence that the presence of such streptococci plays any part in the production of puerperal sepsis. They consider that puerperal hæmolytic streptococcal infection may be regarded in most instances as evidence of exogenous infection, often from the mouth and throat of the attendants. They further think that any manipulation of the vagina increases the possibility of sepsis. In this latter contention they are supported by Franke (1923), who considers that manipulation and examination of a patient *per vaginam* increases the rate of severe infection from about 7 per cent. to 10 per cent. of all cases, while in regard to the milder types of pyrexia the rate remains fairly constant in the region of 30 per cent. of all cases, either with or without examination or manipulation. The percentage of mild infection in Kanter and Pilot's series is 26 per cent. and that of severe infection 10.4 per cent., this being about the average rate of severe infection in most of the statistics studied, although as regards the mild forms figures vary greatly. In the present series the rate of mild infection was only 8 per cent.

Kanter and Pilot found hæmolytic streptococci in only one of their cases, but as their examinations were limited to the antenatal period it seems open to doubt whether the number would have remained so low had examinations been carried out after labour and subsequently during the puerperium. The contention that infection from the mouths and throats of the attendants is not uncommon is at variance with the statement by Gordon (1921) to the effect that the streptococcus hæmolyticus of puerperal sepsis is very rarely found in the mouth or throat. The statement by Kanter and Pilot that streptococci present before labour have little or no bearing on later events is contrary to the weight of the

evidence in the series of cases under discussion. There is, however, a suggestion that the hæmolytic variety are rare inhabitants of the vagina before labour.

The contention that manipulations at labour increase the percentage of febrile cases is undoubtedly correct, but it suggests, rather than disproves the hypothesis that the streptococci found in the genital canal before labour are the potential cause of severe pyrexia.

Hauch (1923) maintains that almost any organism may be responsible for puerperal septicæmia, but that hæmolytic streptococci may be isolated in 80 per cent. of cases. He states that many women harbour streptococci both before and after labour, and that these patients having acquired a resistance to the organisms suffer no harm from them, but if transferred to another parturient a catastrophe may result.

These statements of Hauch bear out the contention that puerperal fever is simply a surgical problem of infection at the operation site, which in these cases consists of abrasions, macroscopical and microscopical, which are the unavoidable results of labour, particularly in primiparæ. It would seem then that puerperal fever is, in the vast majority of cases, an infection with streptococci, the more severe form of the condition being due chiefly to the hæmolytic variety, though not so of necessity. It is a condition predisposed to by manipulation and instrumentation at the birth, more particularly in those individuals who, before labour, harbour streptococci in the genital passages. Primiparæ are more prone to the condition than are multiparæ, more on account of local injuries than because of any inherent susceptibility to this type of infection due to defective defence mechanism.

A summary of the clinical histories of the more important cases of pyrexia is given in Appendix A, while Appendix B contains a list of every case in the series showing the results of all the examinations made.

General Notes on Cases.

Among the afebrile cases the following is of interest. The patient in question had, when admitted to hospital, staphylococcus aureus and streptococci present in the vagina. The third day of the puerperium the child developed an otitis due to staphylococcus aureus, while at the same time from its fæces a very abundant growth of streptococcus hæmolyticus was obtained. There was at the time no case in the ward from which this organism could have been conveyed, nor did any patient then in the ward show any signs subsequently of harbouring it, although careful examinations were made. Hæmolytic streptococci are very rarely, if ever, present

in human breast milk and were certainly not found there in this case, hence it is not at all clear how this infant acquired them in its intestinal tract. Todd (1922) considers that these organisms are exceedingly rare in the stools of infants of this age.

The question that such an appearance of hæmolytic streptococci raises is one of some interest. The series of cases described in this paper included ten patients who developd pyrexia during the puerperium; of these the five most severe gave cultures of hæmolytic streptococci in great abundance. From four of the latter cases hæmolytic streptococci were isolated in almost pure culture as soon as, but not before, the temperature began to rise. The fifth case had a few hæmolytic streptococci present on admission to the ward. One patient who was apyrexial had a few of these organisms present immediately after delivery.

Late Coitus during Pregnancy and its Relation to Infection.

An attempt was made during this investigation to ascertain, in as many cases as possible, what was the last date on which coitus had occurred before the onset of labour. Sixty-one patients gave definite information on this point.

The dates in regard to the ten cases of definite fever were as follows:—

0—7 days	... ...	2 cases.
7—14 days	... ...	2 cases.
5—6 weeks	... ...	3 cases.
24 weeks	... ...	1 case.
Unknown	... ...	2 cases.

Late coitus during pregnancy is apparently common among hospital patients, for of those who gave information 31 per cent. had coitus within seven days, making up 54 per cent. within 21 days from the onset of labour.

Broucha (1923) calls attention to the dangers of late coitus during gestation, maintaining that as many as 50 per cent. of men are carriers of streptococci under the prepuce.

Dealing only with the 61 patients about whom we have information, it appears that among those who were infected with streptococci before labour, the mean average time since the last coitus was 32.5 days whereas among the non-infected the mean average time was 60.1 days. It therefore seems as if we have a very strong suggestion that coitus during the last eight or nine weeks of pregnancy has an adverse effect on the prognosis concerning the puerperium, inasmuch as it seems to increase the percentage of infected women and hence adds an increased element of risk.

PART 2.

The Bacteriological Investigation of Individual Strains of Streptococci.

A question that arises as the result of certain aspects of this investigation is whether the hæmolytic and non-hæmolytic strains of streptococci are distinct types or whether they are merely phases in the life of a common strain, such phases being brought about by the environment in which the organism finds itself.

The hæmolytic property may be either inherent or acquired, but it is not always a constant feature and is often lost when a hæmolytic strain is subcultured repeatedly under laboratory conditions.

With this general question of mutation in mind a few non-hæmolytic strains from the series of cases under review were subjected to the following treatment. They were in the first place subcultured at three day intervals for 18 days on slopes of agar to which 10 per cent. of lochial fluid had been added. The lochia was taken from a patient and immediately made up so as to contain 0.1 per cent. of formalin, it was then incubated at 37°C. for 24 hours, at the end of which time it was tested for sterility, and being found satisfactory was added to melted agar which had been allowed to cool to 50°C. A luxuriant growth of the streptococci was obtained on this medium, but no degree of hæmolysis was found when the organisms were tested. Rapid and repeated subculture on blood agar was equally unsuccessful.

Six strains of the hæmolytic type of streptococcus were isolated from the genital passages of patients in this series, and in addition from the sputum of one of these cases (Case 1) there was isolated a streptococcus which appeared to be identical in every way with that isolated from the vagina of the same patient.

When these strains had undergone repeated subculture on agar for a period of about 10 to 14 weeks they were re-tested for hæmolysis. The result of this test was that the power of hæmolysis was found to have been retained in all except two strains, one of which was the strain from case No. 9, and the second was the strain isolated from the sputum in case No. 1. Thus in the latter case with two strains isolated from the same patient and apparently identical in every way, the hæmolytic power was retained in the one and lost in the other. An attempt was then made to recover the hæmolytic power in the two strains which had apparently lost this property. This was attempted by means of rapid and repeated subculture in Dreyer's medium, serum broth, serum agar and certain other media. It did not seem to matter what medium was

used so long as the subculturing was at frequent intervals, for in both cases the hæmolytic power was recovered, in varying degrees in all the media used, after some five or six subcultures at 24-hour intervals.

Various authorities argue with regard to the hæmolytic and non-hæmolytic types that the two are merely variations of a common strain, while other writers state that they are two distinctly different organisms. The results in this investigation seem to point to the hypothesis that certain strains of streptococci may be capable of exhibiting both properties during different phases in their life. One is inclined to think that the hæmolytic type should be further subdivided into two groups; (a) one whose properties in the matter of hæmolysis are constant, and (b) one whose properties in this respect are variable, class (b) being a hæmolytic streptococcus erroneously classed as non-hæmolytic when found during a phase of its existence when for some reason it has temporarily ceased to function as a hæmolytic organism.

Rosenow (1920) builds up an elaborate theory regarding the mutation *in vivo* of non-hæmolytic into hæmolytic streptococci, and although he quotes several cases there is no more than a suggestion that such mutation may take place. That it occurs on any large scale would appear to be extremely doubtful.

The mutation theory is only raised in the present series of cases in so far as it deals with a hæmolytic organism losing and then regaining its hæmolytic power. No suggestion is intended that truly non-hæmolytic organisms undergo mutation. Rosenow, although he goes further and suggests full mutation, agrees with this contention.

The fact that hæmolytic streptococci were isolated, in four out of the six cases in which they occurred, after the pyrexia had developed, but not before, is capable, one feels, of explanation on three possible hypotheses.

(1). The mutation theory of Rosenow.

(2). The hypothesis that the presence of non-hæmolytic streptococci indicates an unhealthy condition of the genital passages, and hence it is possible for the streptococcus hæmolyticus to flourish, this latter organism having been present in small numbers prior to labour, but not in sufficient numbers to be detected.

(3). The hypothesis that the unhealthy condition of the canal mentioned above renders the patient more liable to acquire an infection with the streptococcus hæmolyticus after admission to hospital.

It would seem that (1) it is only tenable in so far as some of the non-hæmolytic organisms isolated before labour may have been hæmolytic ones examined during a non-hæmolytic phase of

their existence. It is unlikely that the evidence with regard to (2) and (3) would be the same in every series of cases. There is nothing in this particular series to indicate ward infection, except as regards case No. 10. Hence, one is driven to the conclusion that where the mutation theory fails an explanation on the lines of (2) must be offered, namely, that two swabs taken before labour are insufficient to detect hæmolytic streptococci present in very small numbers. There is a possibility that if the swabs taken prior to labour were cultured anærobically the results would have been different and more hæmolytic organisms might have been isolated; such a suggestion is made by Krönig, Williams and Shotmuller quoted by Beckwith Whitehouse (1924), who states in addition that much more work needs to be done on these lines, but that pending this it is best to regard all streptococci in the genital tract as potential sources of infection.

Technique.

The test for hæmolysis used in this investigation, apart from the employment of blood agar, was as follows. Some of the growth from an agar slope was transferred to tubes containing 5 cc. of peptone water to which 0.1 cc. of solid citrated human red corpuscles had been added. Two cultures were made for each strain, one tube containing 0.5 per cent. of NaCl and the other 0.85 per cent.

The heat resistance test applied, consisted of subjecting a 24-hour beef broth culture to a temperature of 60° C. for 15 minutes, allowing it to cool to room temperature and then subculturing it on to agar and incubating at 37° C. for 24 hours.

The fermentation reactions in the following carbohydrate media were also recorded :—lactose, dextrose, mannite, salicin, inulin and litmus milk. The morphology was studied from films made from a culture in dextrose broth + 5 per cent. human blood serum, both at the time of original isolation and also after the organisms had been subcultured on agar every tenth day for 10 to 14 weeks. The morphology was found to be approximately similar on each occasion. Morphological characteristics of streptococci are of no value as a test of pathogenicity and in this series the results support a similar statement by Clawson (1920). The chief distinctions noted apart from the matter of form were in relation to the fermentation of mannite, inulin and salicin, the clotting of milk and resistance to heat. Table 5 shows the results of these tests arranged in three groups. Group A comprises all the hæmolytic streptococci from this series. Group B consists of five strains isolated from febrile cases, but non-hæmolytic in type. Group C consists of some strains from apyrexial cases.

TABLE 5.

	Strain.	G	L	S	I	M	L.M	H	Hm	Morphology	Agglutination Serum 1
A	1	A	A	—	A	—	A+C	–	++	long chain	300/300
	2	A	A	—	A	—	A+C	–	++	long „	300/300
	3	A	A	—	A	—	A+C	–	++	short „	250/300
	4	A	A	—	A	—	A+C	–	++	long „	250/300
	5	A	A	A	—	—	A	–	++	short „	250/300
	6	A	A	A	—	—	A+C	–	+	short „	200/300
	7	A	A	—	A	—	A+C	–	+	short „	250/300
B	3	A	A	A	—	—	A+C	–	–	diplococci	150/300
	5	A	A	A	A	A	A+C	+	–	short chain	100/300
	6	A	A	A	—	A	A+C	+	–	long „	150/300
	7	A	A	A	—	—	A+C	–	–	long „	100/300
	8	A	A	A	A	—	A	–		diplococci	150/300
C	13	A	A	A	A	—	A+C	–	–	diplococci	50/300
	16	A	A	A	A	A	A+C	+	–	short chain	50/300
	18	A	A	A	—	—	A+C	+	–	short „	80/300
	26	A	—	A	A	—	A	–	–	short „	80/300
	29	A	A	—	A	A	A+C	–	–	diplococci	100/300
	33	A	A	A	—	A	A+C	+	–	„	100/300
	39	A	A	A	—	—	A+C	–	–	short chain	50/300
	43	A	A	—	A	—	A+C	–	–	long „	80/300
	44	A	A	A	—	—	A	–	–	long „	50/300
	45	A	A	A	A	A	A+C	+	–	short „	80/300
	47	A	A	A	A	A	A+C	+	–	long „	50/300
	52	A	A	—	A	A	A+C	–	–	short „	50/300
	56	A	A	A	A	A	A+C	+	–	diplococci	100/300
	57	A	A	—	A	—	A	–	–	„	100/300
	58	A	—	A	A	—	A	–	–	„	80/300
	60	A	A	A	—	—	A+C	–	–	short chain	50/300
	64	A	A	—	A	—	A+C	+	–	short „	80/300
	67	A	A	A	A	A	A+C	+	–	long „	50/300
	73	A	A	A	—	—	A		–	short „	80/300
	76	A	A	—	A	A	A+C	+	–	short „	50/300
	80	A	A	A	A	A	A+C	+	–	short „	100/300
	89	A	A	—	A	—	A+C	+	–	short „	80/300
	91	A	A	A	A	A	A+C	+	–	short „	50/300

INDEX.

C = glucose. L = lactose. S = salicin. I = inulin. M = mannite.
L.M = litmus milk. H = heat resistance. Hm. = hæmolysis. A = acid.
A + C = acid + clot.
50/300 = end point 1 in 50 dilution.
Full titre with homologous streptococcus = 1 in 300.

It will be noticed that the strains from pyrexial cases which fermented mannite were all resistant to heat and *vice versa*. Among the apyrexial strains the reaction to mannite and to heat were as follows:—

11 strains fermented mannite ... { 9 resisted heat. / 2 did not resist heat.

12 strains did not ferment mannite { 3 resisted heat. / 9 did not resist heat.

An antiserum was prepared by inoculating a rabbit with hæmolytic streptococcus No. 1 and all the other strains were tested against it. Some difficulty was encountered with auto-agglutination on the part of certain strains, but it was found that excellent results could be obtained and the difficulty avoided by growing the organisms on serum agar. This was made by melting agar and allowing it to cool to 50° C., at which temperature 10 per cent.. of sterile human blood serum was added and well mixed. In order to avoid this trouble of "clumping" the idea occurred of growing the streptococci in serum broth, or on Löffler's medium, but serum agar was found much more satisfactory. A further precaution that was taken was to filter the bacterial emulsion through sterile linen and then to shake it well before using it as an antigen.

The titre of the serum obtained by the inoculation of the rabbit was 1 in 300 with the specific streptococcus.

The results of this serological test are shown in Table 5. None of the 23 strains from apyrexial cases was agglutinated by a dilution of serum greater than 1 in 100.

The results showed that the hæmolytic strains were differentiated from the non-hæmolytic ones by means of this test. Circumstances prevented a full serological set of tests being made or the preparation of a greater number of anti-sera.

Eagles (1924) suggests that the local environment in which streptococci flourish, be it the vagina, the throat or the skin, alters the antigenic properties of the organism, rendering it possible to obtain definite agglutination differentiation between the various strains, such as puerperal, scarlatinal, erysipelatis. The results of his tests in this direction show a definite grouping by serological methods and they bear out the suggestions of the test on the present series.

Gordon (1921) states that in his serological tests of streptococci 100 per cent. of those isolated from cases of puerperal septicæmia fell into his group 1 (*i.e.*, the pyogenes type) which also includes the vast majority of all hæmolytic streptococci. He also states that the streptococcus of puerperal fever is not a normal inhabitant of the mouth and throat.

All this seems to point to the conclusion that whereas any strain of streptococcus may be the cause of the less severe forms of puerperal fever, the more grave types and those associated with fulminating septicæmia are, in the vast majority of cases, caused by a specific infection with a distinct strain of hæmolytic streptococci.

Fermentation reactions do not appear to be of any great value in the differentiation of the puerperal strains, the chief differences are serological and hæmolytic.

One remaining inference drawn from this investigation was that so long as the cultures were taken as high up the vagina as possible the exact area examined was of little or no matter.

Summary of Conclusions.

(1). The presence before labour of streptococci in the genital passage of a pregnant woman indicates an increased possibility of that woman developing puerperal fever.

(2). Any abnormality of, or interference with, labour, especially when occurring in the presence of an existing infection with streptococci, is of adverse prognostic importance.

(3). Hæmolytic streptococci are found more frequently in connection with the severe type of puerperal fever than with the milder forms.

(4). The cases in this series suggested an intrinsic rather than an extrinsic source of infection.

(5). Coitus taking place late in the pregnancy appears to be an additional source of danger.

(6). The existence of an unstable type of hæmolytic streptococcus is suggested.

(7). The figures in this investigation, though admittedly not large, are significant from a statistical point of view.

The author is greatly indebted to Professor L. S. Dudgeon, C.M.G., for much help and valuable criticism; and to Dr. J. S. Fairbairn for kind permission to study and to publish statistics concerning patients under his care.

APPENDIX A.

A summary of the clinical histories of the cases of puerperal fever.

Case No. 1. A very severe case of puerperal septicæmia in a multipara with 14 previous confinements who on this occasion had a placenta prævia. The child being premature died. The patient remained acutely ill for over three months, a pelvic thrombosis having occurred with the accompaniment of multiple emboli. Many rigors occurred during this period. The treatment at the start of the condition consisted of two intravenous injections of perchloride of mercury gr. 1/16 with an interval of three days

between the doses. Rigors began on the fourth day of the puerperium. The patient ultimately recovered.

The blood culture was on three occasions sterile. Hæmolytic streptococci were isolated from blood stained sputum in great abundance on the 12th day. Non-hæmolytic streptococci were abundant in the expressed milk, but no streptococci were found in the fæces. A stock hæmolytic streptococcal vaccine was tried pending the preparation of an autogenous one, but the reaction was so violent that the attempt was abandoned.

The results of the vaginal examinations of this and other cases will be found tabulated in Appendix B.

Case No. 2. A multipara in her second confinement found to be infected on admission to hospital, but hæmolytic streptococci not found until after the pyrexia had made itself evident. The patient had a difficult delivery and suffered considerable perineal laceration. Recovery was uneventful. Streptococci (non-hæmolytic) were found in the breast milk, but not in the blood or fæces.

Case. No. 3. A multipara in her second confinement who had a milder type of fever. Hæmolytic streptococci were not found, but the non-hæmolytic type were isolated from the breast milk. Manual removal of the placenta took place, and the perineum was badly torn.

Case No. 4. A primipara who, previous to admission, had been severely injured by injudicious application of forceps. The pyrexia was of a severe type and the patient felt extremely ill. One intravenous dose of perchloride of mercury gr. 1/16 was apparently very efficacious. The blood culture was on two occasions sterile. The breast milk contained non-hæmolytic streptococci. Ten weeks after discharge from hospital the patient, who was in excellent health, showed a very abundant growth of non-hæmolytic streptococci in her vagina.

Case No. 10. A primipara who, when admitted to the ward, did not show the presence of any streptococci in the vagina. Case No. 4 was in the ward at the time and it is possible that infection was carried from one to the other. The case was a severe one and the patient felt very ill. The blood culture was sterile, but non-hæmolytic streptococci were isolated from the breast milk and from the fæces of the child. Two doses of intravenous perchloride of mercury were of great benefit.

Cases Nos. 5, 6, 7, 8, and 9 although of moderate severity, do not present any points of particular interest. The chief facts will be found in Appendix B.

There were in the series eight cases (Nos. 11 to 18) of very slight fever, only one of which needs comment. Case No. 12, when admitted to the ward, did not show any streptococci, but immediately after delivery some hæmolytic streptococci were isolated. Subsequent examinations failed to show these as still present.

APPENDIX B.

Table Showing Details of all Cases.

Case No.	Parity.	Exam. 1.		Exam. 2.		Exam. 3.		Highest temp.	No. days over 100°F.	Last coitus days.	Strep. in milk.	Type of labour.
		H	NH	H	NH	H	NH					
1	15	o	+ +	o	+ + +	+ + +	+	104·6	43	42	+	A
2	2	o	+ +	o	+ + +	+ + +	+	104·2	7	—	+	A
3	2	o	+ −	o	+ + +	o	+ + +	100·9	7	42	+	A
4	1	o	+	o	+ + +	+ + +	+	101·8	8	168	+	A
5	1	o	+ + +	o	+ +	o	+	100·6	3	35	o	
6	1	o	+ + +	o	+	o	+	100·5	3	7	o	A
7	1	o	+ +	o	+	o	+ + +	101·0	4	13	o	A
8	1	o	+	o	+ +	o	+ +	102·5	3	14	+	A
9	1	+ +	+	+ + +	+ +	+ +	+	102·4	7	4	+	
10	1	o	o	o	o	+ + +	+	104·0	8	—	+	
11	1	o	o	o	+ +	o	o	99·1		21		A
12	1	o	o	+	+	o	+	99·4		—		A
13	3	o	+ + +	o	o	o	o	99·6		—		A
14	1	o	o	o	o	o	+ + +	99·2		14		
15	1	o	o	o	+	o	+ + +	99·7		—		A
16	1	o	+	o	o	−	−	98·8		14		
17	1	o	+	o	+	−	−	99·0		—		
18	1	o	+	o	+ −	−	−	99·0		—		
19	1		o		+ + +			afebrile		—		
20	1		o		o					14		
21	1		+		+ +					14		
22	1		+ −		+ + +					28		A
23	1		o		o					28		
24	1		o		o					31		A
25	1		o		o					—		
26	2		+ + +		+ + +					—		A
27	1		+ +		+ + +					—		A
28	1		o		o					—		A
29	2		+ + +		+ + +					—		
30	1		+		o					112		
31	1		o		o					42		
32	1		o		+					280		
33	1		+ +		+ −					21		A
34	1		o		o					2		
35	3		o		o					—		A
36	1		o		o					14		
37	2		o		+					42		
38	6		o		o					—		
39	4		+ +		−					—		A
40	1		o		o					280		A
41	1		o		o					2		A
42	4		o		+					21		A
43	1		+		+ −					28		
44	1		+		+ −					—		
45	1		+ +		+ + +					4		
46	1		+		o					49		A
47	1		+ +		+ −					3		
48	1		o		o					1		
49	1		+		+					49		A
50	1		o		o					42		
51	1		+		+ +					14		A
52	1		+ +		+					7		

All afebrile

Case No.	Parity.	Exam. 1.		Exam. 2.		Exam. 3.		Highest temp.	No. days over 100° F.	Last coitus days.	Strep. in milk.	Type of labour.
		H	NH	H	NH	H	NH					
53	1		o		o					28		
54	3		+		+ +					35		
55	1		o		o					280		A
56	1		+		+ + +					—		A
57	1		+ + +		o					14		A
58	1		+		o					—		
59	1		o		o					—		
60	1		o		+ + +					3		
61	1		+		+ + +					—		A
62	1		o		o					—		
63	1		o		o					63		
64	1		+ +		+ +					—		
65	2		o		o					—		A
66	1		o		o					—		
67	1		+ −		+ + +					5		A
68	1		+		o					56		
69	1		o		o					28		
70	1		o		+					1		A
71	1		+		+					98		
72	1		o		+ + +					6		
73	1		+ + +		+ + +					—		
74	1		o		+ + +					2		
75	1		+		+ +					—		
76	1		o		+ + +					280		
77	1		o		o					—		A
78	2		o		o			All afebrile		1		
79	1		+		+					—		
80	1		+		+ +					—		
81	1		+ +		+ −					—		A
82	1		o		o					21		
83	1		o		o					—		A
84	2		+		+					1		
85	1		o		+					—		A
86	1		o		o					280		
87	1		o		o					7		A
88	1		o		o					—		
89	1		+		+ + +					10		A
90	1		o		o					7		A
91	1		+		+ +					—		A
92	1		o		o					28		A
93	1		+ +		+ −					2		A
94	1		o		o					—		
95	1		+ +		+					56		A
96	1		o		o					—		A
97	3		o		o					—		A
98	2		o		o					56		A
99	3		o		o					1		
100	1		o		o					—		

INDEX.

Examination 1 = before labour.
„ 2 = after „
„ 3 = at rise of temperature over 99° F.

H = hæmolytic.
NH = non hæmolytic.

A = abnormal labour from any cause.
+ + + = abundant growth.
+ + = many colonies.
+ = few colonies.
+ − = 1 to 3 colonies.
− = no data.

APPENDIX C.

Significance of Statistics.

A possibility exists in every collection of figures that a similar result might have been arrived at by mere chance. Within reasonable limits it is justifiable to draw conclusions from a small series (such as the one described in this paper) if it can be shown that it is a fair sample of the population with which it deals. A fair sample would be one which it is unlikely could be arrived at simply by the play of chance. A formula devised by Poisson is applicable to figures of this type whereby it is possible to estimate their value from the statistical point of view.

A modification of Poisson's formula, quoted by Rudolf (1922), has been applied to the figures in this series of cases.

The difference of two percentages is compared with the standard error arrived at by means of the formula; this gives a ratio either greater or less than unity. If this ratio exceeds unity by more than two one is justified in saying that the figures are statistically significant, if it exceeds unity at all the figures are probably significant, but if it is less than unity the figures are bad samples and the results are worthless until a greater number of cases has been studied.

The result of this test as applied to the figures in the present series is given below.

Ratio in :—

Table 1	= 4.3/1,	*i.e.*, it exceeds unity	by	3.3
Table 2	= 1.6/1,	„ „	„	0.6
Table 3a	= 2.8/1,	„ „	„	1.8
Table 3b	= 2.0/1,	„ „	„	1.0

One feels then that Table 1 is certainly significant, Tables 3a and 3b are most probably significant, and whereas Table 2 is near the border-line it is probable that although a larger set of figures might modify the result slightly it would certainly not be reversed.

With this reservation the figures are offered in the belief that the conclusions drawn are based on an adequate footing, and that although there may be slight modifications necessary the main arguments are justifiable.

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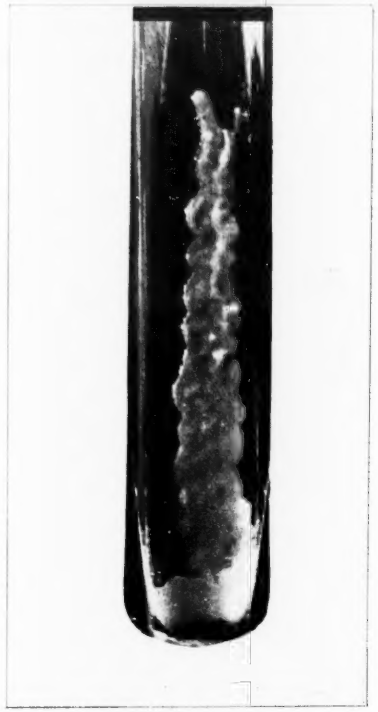

Fig. 1.
Monilia Tropicalis Castellani.
(Glucose-agar culture.)

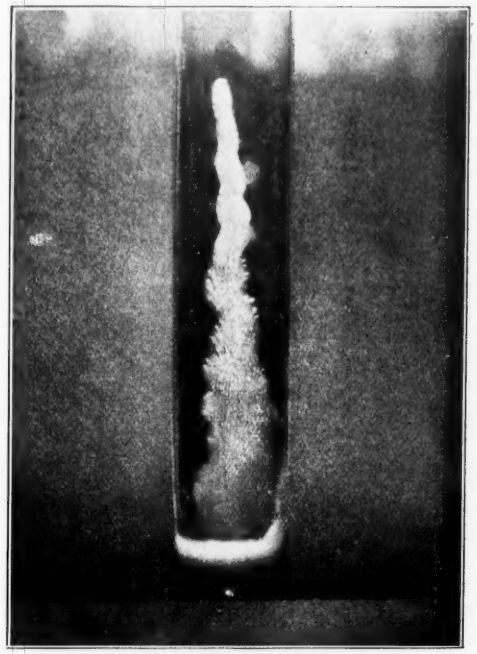

Fig. 2.
Monilia pinoyi Castellani.
(Glucose-agar culture.)

Vaginal Monilias and Vaginal Moniliases.

By

ALDO CASTELLANI, *C.M.G.*, M.D. (Florence), F.R.C.P. (Lond.),
Director, Tropical Medicine, Ross Institute; Physician, Italian Hospital;

and

FRANK E. TAYLOR, M.D., B.S. (Lond.), M.A., M.Sc. (Vict.), F.R.C.S. (Eng.), M.R.C.P. (Lond.), D.P.H. (Cantab),
Lecturer, Bacteriology and General Pathology, King's College, London.

WHEN microscopic examination is made of stained smear preparations of vaginal discharge, large round or oval bodies usually described as yeasts or yeast-like cells are frequently observed. These are present in addition to an extensive bacterial flora which is always observed. As a rule the presence of these yeast-like bodies is straightway ignored on the presumption that they are of no clinical significance. Whether this presumption is justified or not, yet remains to be proved. In the normal vaginal secretion they are present, if present at all, in extremely scanty numbers, being found neither in smears nor in cultures. On the other hand, they are often present in large numbers in cases of vaginitis associated either with an increased amount of vaginal secretion or with membrane formation.

Cultures of these organisms can readily be obtained by smearing a swab moistened with the vaginal discharge over the surface of a glucose-agar or a maltose-agar plate. By fishing and sub-culturing from the thick, creamy-white colonies that develop on the glucose-agar or the maltose-agar plates, pure cultures may be obtained without very great difficulty. (Figs. 1 and 2.) Further study and investigation of the organisms so obtained shows them to belong to the genus Monilia Persoon 1797 of the class Fungi Imperfecti.

Under the name Fungi Imperfecti, Finckel gathered together all the forms of fungi, the complete history of which was unknown, and made this class in contradistinction to his other class of Fungi Perfecti, so that there is some ground for the naïve remark of Lafar in his Technical Mycology that the Fungi Imperfecti are so-called, not because the fungi in this group are themselves imperfect, but because our knowledge of them is imperfect.

They may be defined as follows: Fungi, almost invariably

minute, but much larger than bacteria, in which asexual reproduction takes place by means of conidia produced on conidiophores which are either enclosed in perithecia, placed on discs, or unprotected.

The fungi thus defined were divided into two groups by Vuillemin, *viz.*, the *Deuteromycytes* and the *Hyphales*. It is to the sub-class Hyphales that the monilias belong, and the Hyphales of Vuillemin may be defined as Fungi Imperfect with hyphæ more or less developed, less or more or less compact, superficial or subsuperficial or more rarely as in man, vertebrates and insects, endoparasite Conidiophores never situate in closed or open receptacles. Reproduction by means of spores isolated or in groups, situate on isolated or fasciculated hyphæ. The monilias are included in the family Oösporaceæ in the sub-class Hyphales and the relationship to the other genera of this family—the Oöspora and the Oidium—is seen in the following classification :—

A. Hyphæ thin, short, simple, or nearly simple, terminating in chains of spores—Oöspora, sugars not fermented with gas production.

B. Hyphæ not thin, often long and branched.

I. Sporophores simple and subsimple, typically with disjunction apparatus. Glucose completely fermented, gas being produced. Numerous budding forms in culture—Monilia.

II. Sporophores simple, septate, often with disjunction aparatus. Glucose not completely fermented, gas not being produced. Budding forms rare in culture—Oidium.

According to this classification the botanical definition of the monilias is as follows :—

Sporophores simple or subsimple, producing by constriction at their extremities a chain of large lemon-shaped conidia, often provided with a disjunction apparatus.

The usual definition, however, is as follows :—Oösporaceæ, possessing *in situ* budding forms and mycelial threads, which later are often long and branched ; in *cultures* mostly budding forms but sometimes filaments in which thallospores of the blastophore type are found. Glucose and often other carbohydrate media are fermented with the production of gas.

Very closely allied to, and at present often included in this genus are the Zymonema of de Buermann and Gougerot, 1909, including the Zymonema Gilchristi, more commonly called Cryptococcus Gilchristi, which causes American blastomycosis, the Parasaccharo-

myces of de Beurmann and Gougerot, 1909, and the Parendomyces of Querat and Laroche, 1909.

The genus Monilia is widely distributed in nature, a number of species having been found growing on dead leaves, fruits and decomposing wood. That a number of species may affect man was first pointed out by Castellani, who has shown their importance as the ætiological agents of thrush, bronchomyosis (*pro parte*) and some dermatomycoses, whilst Ashford attributes the causation of sprue to a monilia—*M. psilosis*, which is merely a synonym of monilia enterica, Castellani.

The classification of the monilias has been the subject of much confusion. Morphological grounds do not suffice for a classification, but by means of their biochemical reactions a fairly satisfactory classification has now been reached. By means of the sugar reactions it is possible to divide the species of monilia into groups (1) by the use of the following carbohydrates :—glucose, levulose, maltose, galactose, saccharose, lactose, inulin.

1. *Balcanica group* : Gas produced in *glucose* only. *M. balcanica*, Castellani. *M. parabalcanica*, Castellani.
2. *Krusei group* : Gas produced in *glucose* and *levulose*. *M. krusei*, Castellani. *M. parakrusei*, Castellani.
3. *Pinoyi group* : Gas produced in *glucose*, *levulose*, *maltose*. *M. pinoyi*, Castellani. *M. nabarroi*, Castellani.
4. *Metalondinensis group* : Gas produced in *glucose*, *levulose*, *maltose* and *galactose*. *M. metalondinensis*, Castellani. *M. pseudometalondinensis*, Castellani.
5. *Tropicalis group* : Gas produced in *glucose*, *levulose*, *maltose*, *galactose* and *saccharose*. *M. tropicalis*, Castellani. *M. partropicalis*, Castellani. *M. pulmonalis*, Castellani. *M. nivea*, Castellani. *M. insolita*, Castellani. *M. enterica*, Castellani.
6. *Guillermondi group* : Gas produced in *glucose*, *levulose* and *saccharose* and *raffinose*. *M. guillermondi*, Castellani. *M. pseudoguillermondi*.
7. *Macedoniensis group* : Gas produced in *glucose*, *levulose*, *galactose*, *saccharose* and *inulin*. *M. macedoniensis*, *M. macedoniensoides*.
8. *Pseudotropicalis group* : Gas produced in *lactose* and other carbohydrates. *M. pseudotropicalis*.*
9. *Pseudolondinensis group* : Gas produced in *dextrin* in addition to other carbohydrates.
10. *Zeylanica group* : No gas produced in any sugar.

* It is important to note that many monilias after a few transplantations lose some of their fermentative characters or these are altered. Hence the determination of species is possible only using recently isolated strains.

In the vaginal discharge of cases of vaginitis, Monilia belonging to groups balcanica, pinoyi, metalondinensis and tropicalis, have been found in certain parts of the tropics, in the Balkans, in Italy, and in England. More extended investigation will probably reveal other members of the genus in this condition. The members of Group 1 found were *M. balcanica* and *M. parabalcanica;* of Group 3, *M. pinoyi,* and *M. nabarroi;* of Group 4, *M. metalondinensis;* and of Group 5, *tropicalis.* The principal characters of these organisms, together with other monilias, are set forth in the accompanying table.

In searching the literature we find several references to this subject, thus : Littauer described an aphthous vulvitis due to oidium albicans. He believed that this condition begins as a primary vaginitis and is rarely found in children, but is common in diabetes and in the aged. He also mentions the cases of Plant in Hamburg, in which vaginal thrush and vaginal pruritis were associated with fungi of similar nature.

von Herff has also recorded the occurrence of monilias in the vagina in cases of vaginitis and of vaginal pruritus, considering, however that they were all comprised in the species albicans and candida. Loeser found saccharomyces among the microbic flora of the normal vagina and in cases with cervical catarrh with the formation of erosions, whereas Frank considers that in a perfectly healthy vagina only vaginal bacilli and comma variabile are found in the spread, and as the vagina approaches the pathological, more and more of the bacteria appear. Cases of vaginal thrush have also been described by Guilini, Hausmann, Vleemann, Mettenheimer and Panfilowicz.

Symptomatology. Two clinical types of vaginitis associated with monilias may, in our experience, be distinguished; in the first or membranous type, thrush-like patches of membrane are present on the mucosa (the so-called vaginal thrush); in the second or purulent type, no such patches are present, but the secretion is thick and purulent. Where laboratory facilities do not exist cases of the purulent type of vaginal moniliasis are not rarely mistaken for gonorrhœa. The following illustrative case, which occurred in Ceylon may be quoted : The Surgeon in charge of the Colombo Lying-in Home had a case in which a pelvic operation was urgent; a thick purulent discharge was, however, noted, and acute gonorrhœa was suspected, and he felt inclined to postpone the operation. A specimen of the discharge was sent to one of us for examination. No gonococci were found, but an enormous number of Grampositive mycelial and conidial elements were present. Further investigation revealed the fungus to be Monilia pinoyi Castellani.

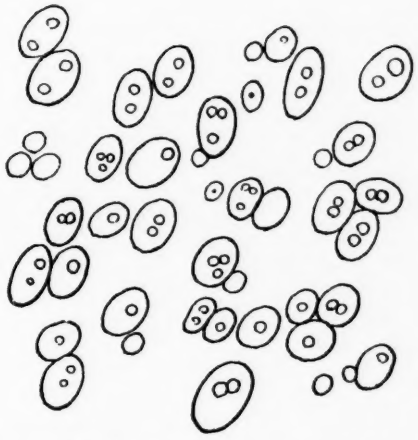

Fig. 3. Monilia tropicalis, Smear preparation from culture.

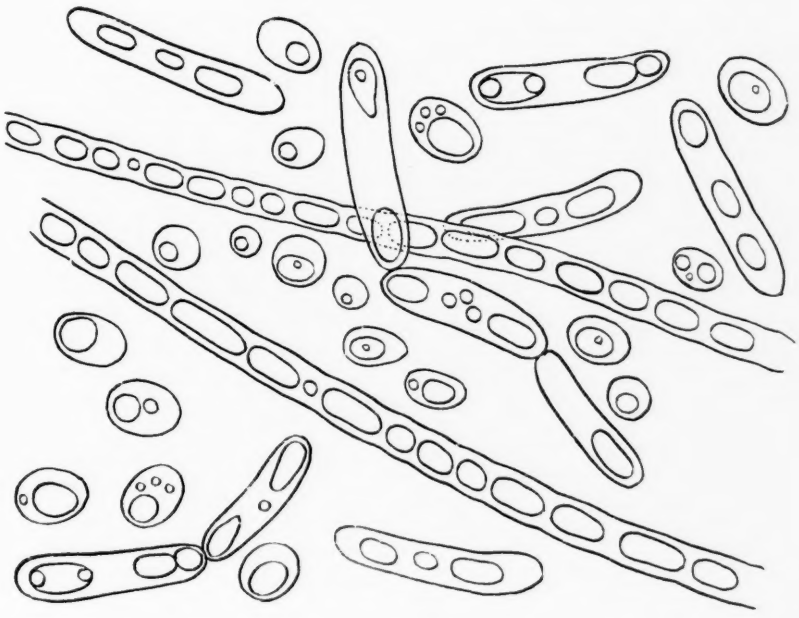

Fig. 4. Monilia tropicalis, from lesions.

Attention may also be directed to the presence of very numerous monilias in certain cases of chronic vaginal pruritus associated with muco-purulent discharge, although we cannot say whether the monilias really play a *rôle* in the causation of the pruritis. In these cases abundant irrigations of iodine (Tr. Iodi 3i Aq. ad. Oij) have answered exceedingly well, especially after a preliminary short course of hot bicarbonate of soda irrigations. We might also call attention to a variety of pruritus vulvæ and pruritus ani described by one of us (C), caused by localization of fungi of the genus Epidermophyton in the ano-perineal region and on the external surface of the labia majora without any objective symptom pointing to an epidermophytic or trichophytic infection. In such cases the fungus remains dormant, and apart from the pruritus, gives rise to no symptoms, although on close examination not rarely a few red patches may be seen. The condition may be compared to the pruritus interdigitalis pedium caused by the localization to the skin of the toes of the same epidermophyton. Fungi in that localization, too, remain dormant causing pruritus but no objective sign pointing to an epidermophytic condition.

Recently we have come across a most interesting case of extremely severe pruritus ani, pruritus vulvæ and pruritus vaginæ in an elderly spinster, of some years duration, which had been treated by different medical men in various ways without any distinct amelioration resulting. In the perianal region, on the perineum and on the labia majora a very few small reddish patches were seen, which it was thought might be due to a secondary pyogenic infection produced by scratching. There was an abundant purulent vaginal discharge and a very similar discharge from the anus, with symptoms of proctitis. A complete mycological and bacterial investigation was carried out with the following results:—

1. From the scrapings of the perianal region and from the labia majora a fungus was grown with the characters of Epidermophyton cruris Castellani 1905, the fungus which is the commonest cause of Dhobie's Itch and pruritus interdigitalis pedium.

2. In the vaginal and in the rectal discharge enormous numbers of monilias were present with very few bacilli; cultivations showed the fungus to be a strain of Monilia pinoyi Castellani.

The following treatment was given:—creosote was administered by the mouth. Tr. Iodi, which in this case did not give rise to any local pain or irritation was freely applied once a day to the anal-perianal region, the perineum and the external surface of the labia majora. For the first three days hot alkaline irrigations (3ij of bicarbonate of soda to two pints of hot water) were given; afterwards, twice a day with iodine irrigation (Tr. Iodi. 3i aq. ad. Oij). Within two weeks the lady was completely free from the ano-

perineal and vulvo-vaginal discharge, and the purulent rectal discharge had ceased entirely, whilst the vaginal discharge had decreased but had not quite disappeared. The monilias present had diminished enormously in number, but had not disappeared completely.

Monilias in the identification of certain Carbon Compounds. Detection of Lactosuria. Certain species of monilia, some of which were isolated from the vagina, have been employed by us in association with other micro-organisms as reagents in a new method of mycological analysis of carbohydrates and other compounds of carbon, theoretically devised by one of us (C) in Ceylon some years ago. The differentiation, for example, of the various Fehling-reducing substances present in urine is readily accomplished by the application of this mycological method. By its use we have been able to recognize the following carbohydrates in urine, viz., glucose, lactose, galactose, saccharose, maltose, pentose, glycerol and inosite. It forms a ready and convenient method for recognizing the presence of lactose in the urine of pregnant and puerperal women, and for differentiating this substance from glucose and other Fehling-reducing substances. The technique of the method may be found in papers published by us in the *British Medical Journal*, 1917, Vol. xvi, No. 5. We will limit ourselves to describing very briefly the detection of lactosuria.

Lactose, as is well known, reduces Fehling's solution and not infrequently lactosuria has been mistaken for true glycosuria. The detection of lactose by purely chemical methods is difficult for an ordinary medical man. In most text-books it is stated that if a urine reduces Fehling and is not fermented by ordinary baker's yeast (so-called German yeast), the presumption is that the reducing substance is *lactose*. There are, however, two important sources of error. First, in our experience, quite a number of specimens of baker's yeast ferment lactose in addition to glucose, maltose and other sugars; second, even if the baker's yeast should not ferment lactose this is not the only Fehling-reducing substance which may not be fermented by baker's yeast—the pentoses, for instance. If a urine which reduces Fehling is not fermented by ordinary yeast we cannot therefore come to the conclusion that it is a case of lactosuria. Our mycological or myco-bacterial method, on the other hand, renders possible the detection of lactosuria in a very easy manner.

The urine is collected aseptically, or if this is not feasible, is distributed into sterile tubes (each containing a small fermentation tube) as soon as passed and then sterilized in Koch's stove for 30 minutes on two or three consecutive days, or the urine may be filtered through a sterile Berkefeld filter. *It should never be auto-*

claved, as this procedure not rarely alters the chemical structure of the sugars. Two or three tubes of the aseptic urine to which one-third or the same amount of sterile sugar-free peptone water has been added, are inoculated with certain monilias and other micro-organisms as follows:—

(a) No. 1 tube is inoculated with *M. pseudotropicalis*. No. 2 tube is inoculated with *M. tropicalis*. The two tubes are placed in the incubator at 37° for three days and then the results are read. If No. 1 tube (*M. pseudotropicalis*) contains gas and No. 2 (*M. tropicalis*) does not, we can come to the conclusion that in all probability the urine contains lactose. This is easily explained by keeping in mind the biochemical reactions of *M. tropicalis* and *M. pseudotropicalis*. These two monilias differ only in regard to lactose and maltose, *M. pseudotropicalis* fermenting maltose but not lactose; a substance, therefore, which is fermented by *M. tropicalis* must in all probability be *lactose*. This is represented by the following mycological formula:

M. pseudotropicalis ... ... + }
M. tropicalis ... ... o } = Lactose.

(b) No. 1 tube is inoculated with *B. neapolitanus Emmerich*. No. 2 tube is inoculated with *B. pseudoasiaticus Castellani*. If after two days in the incubator at 37° No. 1 tube (*B. neapolitanus*) contains gas and No. 2 tube does not contain gas, we can come to the conclusion that the urine contains lactose. The explanation lies in the fact that *B. neapolitanus* and *B. pseudoasiaticus* differ only in lactose as regards sugars and other carbohydrates found in pathological urines.

B. neapolitanus ... ... + }
B. pseudoasiaticus ... ... o } = Lactose.

(c) Tube 1 is inoculated with *B. coli*, Tube No. 2 with *M. metalondinensis*. If after 48 hours there is fermentation in No. 1 tube and no gas in No. 2 tube, we can come to the conclusion that lactose was present, provided Fehling was positive.

Fehling ... ... + }
M. metalondinensis ... ... o } = Lactose.
B. coli Eserich ... ... + }

(d) In practice, the following procedure is very convenient. No. 1 tube is inoculated with *B. coli Escherich*, No. 2 tube with *B. paratyphosus B. Schottmüller*. If fermentation occurs in Tube No. 1 (*coli*) and does not occur in Tube No. 2 (*paratyphosus*) we may come to the conclusion that the urine contained lactose, provided

Fehling was positive. This is easily understood by remembering that *B. coli* and *B. paratyphosus*, besides lactose, differ in their action on *raffinose* and *salicin*, but *raffinose* and *salicin* are not Fehling-reducing.

Fehling	+	= Lactose.
B. coli Escherich	+	
B. paratyphosus B. Schottmüller	o	

Further details on the method may be found in our publication in the *Annales de l' Pasteur* (November, 1922).

Vaginitis associated with fungi other than monilias. In addition to fungi of the genus *Monilia Persoon*, we may add that one of us (C) has found occasionally in the vaginal secretion of native women suffering from very chronic vaginitis in the tropics, fungi of the genus Oidium (Link), Aspergillus (Micheli), Sporotrichum (Link) Chladosporium (Link) Sterigmatocystis (Cramer), Cryptococcus (Kutzing, 1833), Willia (Hansen), Vibriothrix (Castellani), and others. Recently we have observed two such cases in European women in England in one of which aspergillus was grown, in the other a hemispora, but the presence of fungi other than monilia in the vaginal secretion will form the subject of a future communication.

Conclusions.

1. In the normal vagina monilias and other fungi appear to be constantly absent.

2. In certain cases of vaginitis, vulvo-vaginitis and of vulval vaginal and ani-perineal pruritus, monilias are abundantly present and may perhaps play some *rôle* in the etiology of such cases, or at least produce the associated purulent or muco-purulent discharge.

3. Two principal types of vaginitis are associated with the presence of monilias, namely, (*a*) the membranous type, presenting white patches of membrane on the vaginal mucosa, the so-called "vaginal thrush," and (*b*) the purulent type, with thick purulent vaginal discharge containing enormous numbers of monilias and sometimes simulating gonorrhœal infection.

4. Monilias, along with other micro-organisms, are employed in the authors' mycological method of identification of carbohydrates and other carbon compounds. This method is especially useful in the detection of lactosuria.

5. Attention is also directed to the presence of several genera of fungi other than the monilias in the vaginal secretion of cases of chronic vaginitis.

TABLE I.—Showing Characters of Various Monilias.

	Glucose.	Levulose.	Maltose.	Galactose.	Saccharose.	Lactose.	Mannite.	Dulcite.	Dextrin.	Raffinose.	Arabinose.	Adonite.	Inulin.	Sorbite.	Starch.	Glycerine.	Inosite.	Salicine.	Amygdalin.	Insodulcite.	Erythryte.	Gelatine.	Serum.	Litmus Milk.	Colour of growth on glucose agar.
M. zeylanica, Castellani	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	C	Yellowish.
M. balcanica, Castellani	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	C	White.
M. parabalcanica, Castellani ...	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	C	White.
M. krusei, Castellani...	G	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	White.
M. parakrusei, Castellani	G	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	C	White.
M. pinoyi, Castellani	G	G	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	White.
M. nabarroi, Castellani	G	G	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	C	White.
M. metalondinensis, Castellani ...	G	G	G	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	White.
M. pseudo-londinensis, Castellani ...	G	G	G	G	o	o	o	o	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	C	White.
M. alba, Castellani	G	G	G	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	C	White.
M. pseudo-londinoides, Castellani...	G	G	G	G	o	o	o	o	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	C	White.
M. africana, Macfie, 1921	G	G	G	o	G	o	o	o	G	G	o	—	o	o	o	o	o	o	o	o	o	o	o	o	
M. albicans, Robin	G	G	G	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	+	+s	C	White.
M. tropicalis, Castellani	G	G	G	G	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	White.
M. metatropicalis, Castellani ...	G	G	G	G	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	C	White.
M. rhoi, Castellani	G	G	o	G	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	White.
M. Guillermondi, Castellani ...	G	G	o	o	G	o	o	o	o	G	o	o	o	o	o	o	o	o	o	o	o	o	o	o	White.
M. macedoniensis, Castellani ...	G	G	o	G	G	o	o	o	o	o	o	o	G	o	o	o	o	o	o	o	o	o	o	C	White.
M. macedoniensoides, Castellani ...	G	G	o	G	G	o	o	o	o	o	o	o	G	o	o	o	o	o	o	o	o	o	o	o	White.

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Observations of Intracranial Hæmorrhage in 400 Consecutive Newborn Babies.*

By William Sharpe, M.D., and A. S. Maclaire, M.D.,

From the Department of Neurosurgery, N.Y. Polyclinic Hospital and Post-graduate Medical School, New York City.

The condition of intracranial hæmorrhage in the newborn has only infrequently been diagnosed in the acute stage within ten days after birth, unless the hæmorrhage and the associated cerebral œdema were of such a large amount that either death occurred or the baby exhibited signs of a severe cerebral lesion. Until recent years the literature of intracranial hæmorrhage in the newborn has been concerned with these extreme cases, either as post-mortem studies of extensive intracranial hæmorrhage due to laceration of the large sinuses, or falx, or as clinical observations of the marked signs of a probable intracranial lesion of hæmorrhage—stupor to the degree of unconsciousness, refusal to suck or even repeated general convulsive seizures—and the description of methods to increase the coagulability of the blood and in this manner lessen the cerebral damage and its resulting chronic condition of cerebral spastic paralysis with mental retardation.

In the period of 1826 to 1835, Denis,[1] Billard,[2] and Cruveilhier[3] published several papers intimating and suggesting the causal relationship of intracranial hæmorrhage at birth and the later development of cerebral spastic paralysis. In 1843, Little, of London, stated in his first monograph upon the subject of "Deformities of the Human Frame,"[4] that difficult labour might be an etiological factor, but that lack of development of cerebral tissues and meningitic inflammatory processes were the usual cause; only nineteen years later (1862), in his second monograph upon this subject,[5] Little stated that as a result of further study and especially of a large series of post-mortem examinations, he was of the opinion that almost 75 per cent. of the cases of cerebral spastic paralysis were due to an intracranial hæmorrhage at the time of birth. In 1885, Sarah McNutt[6] confirmed this opinion by careful pathological studies. More recently, Beneke[7] in 1910, Pott[8] in 1911, Mayer[9] in 1915, Holland[10] in 1920, and within the past four years Schafer,[11] Schwartz,[12] Saenger,[13] and Capon[14] and others have contributed valuable post-mortem observations and yet the literature of the

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clinical observations has been most meagre. In this country Green,[15] Brady,[16] Sidbury,[17] Warwick,[18] Rodda[19] and Huenekens[20] have all added to the knowledge of the subject during the past decade, and the present paper is a similar effort to facilitate the diagnosis and thus make possible the *early* rational treatment of the condition.

In 1913, one of the writers became interested in the chronic condition of cerebral spastic paralysis in its various forms with and without marked mental impairment. It was very impressive at that time[21] and during the past eleven years to note repeatedly in the histories of a large percentage of these patients—those having an increased intracranial pressure as disclosed by the ophthalmoscope and more accurately by the spinal mercurial manometer—that they were chiefly first-born fulltime males. The majority of these children had been delivered after a prolonged labour with or without the use of instruments. During the first week, and even two weeks after birth, they had been considered rather drowsy and stuporous with a lack of the normal demand for food, and even refusal to suckle, and in many of them there was a history of twitchings of the orbital muscles and of the hands and legs or of even generalized stiffenings to the degree of convulsive seizures. After a period varying from several days to two or three weeks, the baby rapidly improved and was considered a normal child at the end of one month after birth and continued to be so apparently, until several months later. Usually about the seventh or eighth month, it was observed that the child was not holding up its head nor attempting to sit up, and frequently at this time a spasticity appeared in the arm and leg of one or of both sides; later, when the child did not walk or talk, if at all, until months after the usual time, this chronic condition developing in an apparently normal child, was most puzzling. Frequently the diagnosis of Little's disease implied a tainted heredity and lues as the etiological factors in the lack of development. (In our series of these chronic cases, the blood serum and spinal fluid Wassermann tests have been positive in only half of one per cent. (1 in 200 cases). That the condition might be the result of an intracranial hæmorrhage at the time of birth was very improbable, as it was believed and taught that intracranial hæmorrhage was of such an extensive character and of such great danger to the life of the newborn that the baby usually did not survive. The earlier study, moreover, of the acute condition of intracranial hæmorrhage in the newborn was limited chiefly to post-mortem examinations and therefore to the study of the extreme condition sufficient to cause death at the time of birth or within several days after birth.

During the past eleven years we have had the opportunity to examine, both at the operation and at autopsy, the brains of a large series of the chronic cases of cerebral spastic paralysis having a definite increase of the intracranial pressure. The pathology has been practically the same—"wet" œdematous brains under varying degrees of increased pressure, and along the supra-cortical veins in the sulci has been demonstrated the cloudy whitish new-tissue formation with a fibrous thickening of the walls of these veins—the organization residue of a former layer of supra-cortical hæmorrhage which had occurred most probably at the time of birth and of larger amount than could be entirely absorbed by the natural means of excretion. Since it has now been demonstrated that over 80 per cent. of the cerebrospinal fluid is normally excreted through the walls of the supra cortical veins, the partial blockage of this main channel of excretion and cerebro-spinal fluid, by the organization-residue of a former hæmorrhage in these patients, explains the "wet" œdematous condition of the brain under varying degrees of increased pressure and the resulting spastic paralysis in its various forms associated with a mental retardation of varying degree. The treatment of these chronic conditions in the older patients can, at best, be directed only toward an improvement—lowering the increased intracranial pressure, mental training, the use of orthopædic measures (braces, tendon lengthenings, muscle transplantations) and the more recent peripheral nerve operations of Stoeffel, including the sectioning of the rami (ramisectomy) of the sympathetic ganglionic chain as advocated by Royle and Hunter.

During this same period of eleven years, we have had the opportunity of examining in consultation and treating 59 newborn babies within the first ten days after birth. The signs of an acute severe intracranial lesion were very evident—stupor and coma, refusal to suckle and muscular twitchings to the degree of convulsive seizures. Lumbar puncture in these early cases revealed bloody cerebrospinal fluid under varying degrees of increased pressure. Repeated lumbar punctures or spinal drainage in the milder cases or the modified subtemporal decompression or cranial drainage in the more severe cases made possible a recovery of life in a small percentage of them. One of the patients in this series (in 1920), on the third day after a difficult instrumental birth, appeared to be a normal baby with the exception of spasmodic twitchings of the left orbital muscles two or three times each hour. Careful neurologic examination was negative, but a lumbar puncture was advised merely to confirm these negative findings, so that the parents could be assured that no intracranial complication had occurred. Two hours later and *before* the lumbar puncture was performed, the baby

suddenly died. At the autopsy there was disclosed a supra-cortical hæmorrhage of over one inch in thickness upon both cerebral hemispheres—the longitudinal sinus having been torn at the posterior margin of the anterior fontanelle. This case, and the mildness and even apparent lack of the definite signs of severe intracranial hæmorrhage in the other acute cases, as disclosed both at operation and at autopsy, led to the belief that possibly an intracranial hæmorrhage of mild degree at the time of birth did not produce marked clinical signs of its presence owing to the less highly developed cortical cells at this early age. Possibly, therefore, the complication of an intracranial hæmorrhage at the time of birth was of more common occurrence than was ordinarily suspected.

First Series.

To determine the frequency of this complication in the newborn, permission was obtained in January, 1923, from Drs. F. A. Dorman and Wilbur Ward to perform a routine lumbar puncture upon a series of consecutive newborn babies, at the City Hospital, Welfare Island. In the first series[22] of 100 consecutive newborn babies, the cerebrospinal fluid was bloody in four and blood-tinged in five, that is, a total of nine (9 per cent.) and under varying degrees of increased pressure (the normal pressure in the newborn after one week being approximately 3 to 5 mm. as registered by the spinal mercurial manometer). As many as four lumbar punctures of spinal drainage were necessary in only one case to obtain clear cerebrospinal fluid and under normal pressure. Two of these babies died and the autopsy revealed a large ventricular hæmorrhage in one and a mild subarachnoid hæmorrhage with extensive cerebral œdema in the other. The post-mortem findings of free blood along the supracortical veins in the sulci confirm the observations made at autopsy and at operation upon the other acute cases in the newborn. These support the belief that if this free blood cannot be entirely absorbed, then an organization-residue occurs *in situ* with the resulting partial blockage of the excretion of the cerebrospinal fluid—the usual pathology in the cases of cerebral spastic paralysis having an increased intracranial pressure and due to an intracranial hæmorrhage at the time of birth. Repeated lumbar punctures of spinal drainage at intervals of 12 hours were sufficient to make the cerebrospinal fluid clear and under normal pressure in the remaining seven cases. No instruments had been used in these nine cases; one was a version with breech extraction; in two, the cord was round the neck. The low forceps had been applied in ten cases of this series, but no intracranial hæmorrhage had occurred in these particular instrumental deliveries. The cord-Wasserman was negative in every case. Two were reported as "jaundiced."

One baby in whom convulsive twitchings developed ten hours after birth had clear cerebrospinal fluid and the muscular twitchings ceased within six hours after the lumbar puncture—being the result possibly of the cortical irritability of a mild cerebral œdema.

Second Series.

In the second series[23] of 100 consecutive newborn upon whom a lumbar puncture was performed within 12-24 hours after birth, bloody cerebrospinal fluid of varying degree was found in 13—that is in 13 per cent.; nine were bloody, three blood-tinged, and one was yellow, containing many red blood cells. There was no mortality in this series and the intracranial pressure in the bloody cases ranged from 4-26 mm.; five punctures of spinal drainage were the largest number necessary to obtain clear cerebrospinal fluid under normal pressure. The anterior fontanelle did not appear to be an accurate index to the intracranial pressure. Two of the babies exhibited muscular twitchings of the face hands and feet and also cyanosis of the face, which disappeared within six hours after the lumbar puncture. Marked signs, such as stupor, refusal to suckle or convulsions were not present in any of the cases. The labour in these 13 bloody cases was normal cephalic in six, prolonged in three, two of which terminated as cephalic presentations and one as a breech; medium-forceps was used in two; one was a face presentation and one the child of an eclamptic mother. Jaundice was present in one case only. The coagulation time of the blood was normal in all 13 bloody cases; one case clinically diagnosed as hæmorrhagic disease of the newborn did not have an intracranial hæmorrhage and the 13 cases having bloody cerebrospinal fluid did not have the disease. Ten babies were of luetic mothers and in only two of them was the cerebrospinal fluid bloody.

Third Series.

In the third series[24] of 100 consecutive newborn babies upon whom a lumbar puncture was performed within 12–24 hours after birth, bloody cerebrospinal fluid of varying degree was found in 10, that is 10 per cent.; the fluid was red with blood in four and straw-coloured and yellow with many red blood cells in six. Six was the highest number of lumbar punctures necessary to obtain clear cerebrospinal fluid under normal pressure. There were no deaths in this series. Seven babies born of luetic mothers all had clear cerebrospinal fluid. The forceps was applied in nine cases in this series; of the two medium-applications, in one the cerebrospinal fluid was blood-tinged and in the other bloody, and in the seven low applications only one baby had free blood in the cerebrospinal fluid. The one case of version with breech extraction had clear cerebrospinal fluid. The intracranial pressure ranged from

3-15 mm. and again the anterior fontanelle was not a reliable indicator of the intracranial pressure. The blood coagulation time was not lengthened in any of the four bloody cerebrospinal fluids, and in only one of the yellow fluids was it slightly prolonged to 10 minutes (normal clotting time being considered as five to eight minutes). However, in four cases having clear cerebrospinal fluid, the blood-clotting time was $8\frac{1}{2}$—11 minutes, so that it seems that the hæmorrhagic tendency in the newborn is only of minor importance as an etiological factor in the production of the intracranial hæmorrhage. Four babies, in whom the cerebrospinal fluid was clear within 27 hours after birth became jaundiced on the second, third, sixth and seventh day respectively; in two of these babies the blood coagulation time was four minutes, and in the other two, 10 and 11 minutes, respectively.

Fourth Series.

In the fourth series of 100 newborn babies upon whom a lumbar puncture was performed within 24—48 hours after birth, the cerebrospinal fluid was bloody in four and straw-coloured in three—a total of seven (7 per cent.). One baby having bloody cerebrospinal fluid died and the autopsy revealed extensive intraventricular, basal and supracortical hæmorrhages. Jaundice was present in four babies, in three of whom the spinal fluid was clear and in one a golden yellow, slightly turbid with numerous red blood cells. In the latter case the jaundice appeared on the seventh day, and it is interesting that the first lumbar puncture, performed fourteen and a half hours after birth, was clear, under 6 mm. of pressure and the blood-clotting time was seven minutes; whereas when jaundiced, one cerebrospinal fluid was yellow with red blood cells, under 8 mm. of pressure and the blood-clotting time was four minutes.

As in the preceding three series of the newborn, neither sex predominated and approximately 50 per cent. were first-born babies. The signs observed in this series of newborn were the following: in five muscular twitches of the extremities and face and convulsive seizures, in two of whom the cerebrospinal fluid was bloody, but in the other three clear. Poor suckling in one, and in this particular baby the fluid was yellow with many red blood cells. Cyanosis was present in one baby having clear fluid. Normal intraspinal pressure (5-8 mm. of mercury within 48 hours after birth) was present in 45 cases, one of them having yellow fluid; above normal in 32, six of them having bloody or yellow fluid, and below normal in eight, and in these the fluid was clear. Seven premature babies were not punctured. Venous contamination of puncture occurred in two cases, and in five babies the spinal canal could not be tapped, due presumably either to faulty technique or to anatomical variation. In one case the pressure was not recorded.

The blood-clotting time was normal (3-8 minutes) in 81, seven of the babies having hæmorrhagic cerebrospinal fluid; prolonged in two ($8\frac{1}{2}$ and 10 minutes respectively); below normal in one and not recorded in 16 (these included the babies not punctured or successfully tapped and the premature babies). The anterior fontanelle was flush in 38, and of these four had hæmorrhagic fluid; depressed in 39, of whom three had hæmorrhagic fluid; bulging in 14, and in them all the fluid was clear. The status of the fontanelle was not recorded in nine.

In five mothers the Wassermann test was 4 plus, and in four babies the Wassermann was 4 plus in three and 2 plus in one; only one luetic child had bloody fluid. Seven of the nine premature babies were not punctured on account of their low vitality; three of these babies died and the autopsy did not reveal an intracranial hæmorrhage.

Type of labour. The position was left occipito-anterior in 49, of whom four had hæmorrhagic fluid; in 23 it was right occipito-anterior, of whom one had yellow fluid, and right occipito-posterior in one with clear fluid. The low forceps was used in 10, of whom one had bloody fluid. Prolonged labour in two, one having blood-tinged cerebrospinal fluid. One dry labour, one Cæsarean section, one frank breech and one induced labour had clear fluids.

Impressions. Acute intracranial hæmorrhage and cerebral œdema of varying degree occur more frequently in the newborn than formally suspected. Unless the hæmorrhage is of large amount, the usual signs of intracranial hæmorrhage in the newborn are meagre (drowsiness, difficulty in nursing and slight muscular twitchings) or even apparently absent. At present, early lumbar puncture is the only accurate means of diagnosis and especially in the mild and so-called signless cases. The therapeutic lumbar punctures of spinal drainage should be repeated as frequently as the severity of the intracranial hæmorrhage warrants—every 12-24 hours, and even more frequently. Babies of low vitality, and especially if premature, or babies in a state of shock, should not be punctured, even in the presence of signs of an intracranial hæmorrhage, until the general condition improves. This is true of brain injuries in adults as in the newborn. The treatment should be directed to the general condition of shock rather than to the local intracranial condition. If the patient is unable to survive the shock, no examination or tests will aid, but rather increase the shock. Muscular twitches of fingers, extremities, face and orbits are very suggestive as signs of increased cerebral irritability and due to supra-cortical hæmorrhage or cerebral œdema. The use of early and correctly applied forceps, especially the application of the low forceps, does not increase the liability to intracranial hæmorr-

hage. In prolonged labour causing extreme intracranial venous stasis, especially when instruments are used as a last resort, and particularly delayed medium forceps, the danger of the occurrence of intracranial hæmorrhage is greatly increased. Hæmorrhagic disease of the newborn does not appear to be an important etiological factor. Yellow spinal fluid in the newborn is most probably the result of transudation of the blood-plasma when red blood corpuscles are absent (the hæmoglobin not being demonstrated by the guaiacum test) and due to minute hæmorrhage when red blood corpuscles are present. Early lumbar puncture as a diagnostic and therapeutic aid is not advocated as a routine procedure, but only in doubtful and suspected cases of intracranial hæmorrhage. Early recognition of intracranial hæmorrhage at the ideal time for treatment should permit the greatest possible recovery, both of life and of future normality. By this procedure that large group of physically and mentally impaired children having the chronic condition of cerebral spastic paralysis with varying degrees of mental retardation, may be lessened.

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FIG. 1. HÆMORRHAGIC CASES.

No	Name	Para	Labour or Position	Anterior Fontanelle	Character of Spinal Fluids	Press. In Hg.	Blood Clot. Time	No. L.Ps. to Clear Fluid	Miscellaneous
1	M. S. White	i	L.O.A.	Flush	Yellow (clear)	6 mm.	3½ m.	3	—
2	E. P. Coloured	ii	L.O.A.	,,	Bloody	10 mm.	6 m.	—	Died at 14hrs. of age. P.M. Hæmorrhage of Base, Cortices & Ventricles.
3	M. Z. Coloured	i	Prolonged	,,	Blood-tinged	10 mm.	5 m.	4	Convulsion 4th day. Recovery.
4	W. F. White	iii	Low Forceps	,,	Bloody	10 mm.	7 m.	3	4 + Wass.
5	E. P. Coloured	i	L.O.A.	Depressed	Bloody	9 mm.	5½ m.	3	—
6	R. F. White	iii	L.O.A.	,,	Yellow (clear)	16 mm.	7½ m.	2	Cord around neck.
7	E. H. Coloured	ii	R.O.A.	,,	Yellow c R.B.C.	10 mm.	3½ m.	2	Suckled poorly.

FIG. 2. CLEAR FLUID CASES & SIGNS.

No.	Name	Para	Labour or Position	Anterior Fontanelle	Character of Spinal Fluids	Press.	Clot. Time	Signs.
1	S. K. ? Coloured	i	R.O.A.	Flush	Clear	8 mm. Hg.	7 m.	Cyanosis.
2	G. S. Coloured	ii	R.O.A.	,,	,,	6 mm.	4 m.	Twitches of arms & legs.
3	S. L. White	i	Prolonged	Bulging	,,	12 mm.	3 m.	,,
4	R. A.	i	Dry	,,	,,	12 mm.	3½ m.	Convulsions.

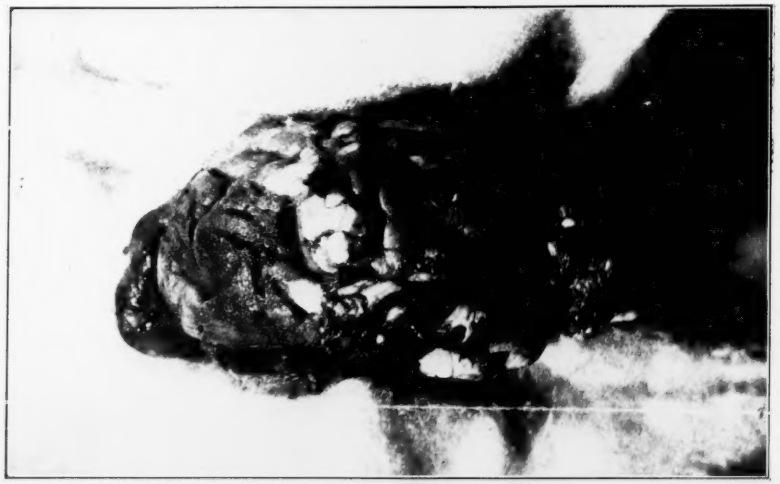
FIG. 3. TYPES OF LABOUR OR POSITIONS.

L.O.A. ...	... 49	... Of these 4 abnormal fluids	{ 2 yellow (clear) fluids 2 bloody fluids.	
R.O.A. ...	... 23	... „ „ 1 „	fluid	(yellow c̄ R.B.C.)
R.O.P. ...	... 1	...		
Low Forceps	... 10	... „ „ 1 „	„	(bloody).
Dry Labour	... 1	...		
Prolonged	... 2	... „ „ 1 „	„	(blood-tinged).
Cæsarean	... 1	...		
Breech ...	... 1	...		
Premature labours.	9	...		
Not Mentioned	... 1	...		
Normal ...	... 1	...		
Induced ...	... 1	...		

c̄ R.B.C. = Red blood corpuscles.

Case No. 2.—E. P.
Showing hæmorrhage within the spinal canal.

Case No. 2.—E. P.
Showing hæmorrhage at the base, both above and below the tentorium.



Case No. 2.—E. P. Showing supra-cortical hæmorrhages.

CRITICAL REVIEW.

The Physiology of the Placenta.*

By

GILBERT I. STRACHAN, M.D., M.R.C.P., F.R.C.S. (Eng. and Ed.),

Assistant Gynæcologist to the Cardiff Royal Infirmary;
First Assistant to the Professor of Obstetrics and Gynæcology,
the Welsh National School of Medicine.

THAT the main function of the placenta is to act as a clearing house whence nutritive substances are passed to the fœtus and waste products from the fœtus are passed to the maternal circulation for ultimate elimination is admitted by all. But the exact mechanism of assimilation, the form in which the elements are absorbed, and the probability of the placenta having functions extra to those mentioned, are a few only of the controversial questions that arise when the matter is considered closely, and it is with the object of placing before the reader the present state of our knowledge regarding these points that this review is compiled.

In a recent number of this Journal our knowledge regarding the development and structure of the placenta was reviewed by the writer, and in that article the function of the organ was necessarily touched on, although lightly. In the present review, matters are reversed, and the structure of the placenta will be referred to only as necessity arises.

The chemical composition of the organ will be considered first, then the processes of elimination and absorption, and finally any other functions of the organ.

COMPOSITION OF THE PLACENTA.

Sfameni (quoted by Feldman) has analyzed the placenta and finds the composition as follows:—

	per cent.
Water	83.67
Solids	
(a) Organic matter	15.45
(b) Inorganic matter	
(1) Soluble Salts	0.73
(2) Insoluble Salts	0.13
	99.98

This shows that the placenta contains a large proportion of water and that almost all the solids are organic.

*Part of a report to the Medical Research Council on "The Present Position of our Knowledge Regarding the Human Placenta."

Grandis found that the ash of the placenta had the following composition :—

	Placental ash.	Albuminous ash from unirrigated placenta.	Albuminous ash from irrigated placenta.
Chlorine ...	11.4	—	—
Sulphur ...	0.204	—	—
Sodium ...	24.93	0.257	0.782
Potassium ...	6.57	—	—
Phosphates ...	33.46	55.18	14.5
Calcium Oxide	2.32	—	—

This table demonstrates (1) that placental ash contains a large amount of water—soluble phosphates; (2) the large amount of lime : calcareous concretions are often found on the maternal surface of the placenta as small gritty nodules or flakes; (3) the great excess of sodium over potassium in the ratio of about 4 to 1 is also a marked feature.

Harada, as the result of chemical examination of 120 fresh placentæ, found xanthine, adenine, arginine, histidine, choline, lysine, uracil, leucine, alanine, proline, glutaminic acid and lactic acid constantly present. The lactic acid increases in amount rapidly on autolysis. To this list must be added also the various enzymes which are discussed later.

Regarding the composition of the organ at different periods of pregnancy, Fenger found in the cow that the maternal placenta remains of fairly constant composition throughout pregnancy, while the fœtal placenta varies considerably in composition at different stages of gestation.

Placental Transmission and Assimilation.

The consideration of this opens up the whole subject of embryonic and fœtal nutrition, and it has to be admitted that, in spite of the large amount of investigation performed in recent years, our knowledge of the physiology of the fœtus is far from complete.

During the fourth week of intra-uterine life the chorionic villi become vascularized by the extension into them of the ultimate branches of the umbilical vessels. By this event the process of fœtal nutrition is divided into two phases. In the early phase, during the first month of gestation, nourishment is obtained for the ovum and its contents by a process of direct absorption and osmosis.

Immediately after fertilization the ovum is surrounded by a sticky layer of albuminous material formed from the disintegrated

corona radiata or from the tubal and uterine secretion. Before this source of nourishment is exhausted the ovum has penetrated the uterine mucosa, and, by the action of the histolytic ferment secreted by the trophoblast, has become surrounded by a zone of necrotic decidua whose *débris* form another source of nourishment for the ovum. Still later the trophoblast is stimulated by the necessity for procuring further nourishment to throw out buds—villi—all round the circumference of the ovum. These buds destroy whatever tissue they meet, but are attracted especially to vascular tissue—decidual blood vessels. The vessels are eroded, and the contained blood is extruded all round the ovum and between the villi, forming a hæmorrhagic layer from which nourishment is continually absorbed by the trophoblastic epithelium by a process of osmosis, until chorionic blood vessels are formed at the end of the first month, when the final—the hæmotrophic—stage of development is entered upon.

In the hæmotrophic stage it is probable that considerable selection is exercised by the trophoblastic epithelium, and such materials as are absorbed by the trophoblast enter the chorionic—umbilical—vessels and are transmitted to the developing embryo.

It is more than likely that in the earliest stages described above similar selection is also exercised, but our knowledge on this point is almost *nil.*

At present two main theories hold the field to explain the passage of the elements of nutrition from the maternal to the fœtal blood.

The vitalistic theory is to the effect that the epithelial cells covering the chorionic villi have a selective action in assimilating suitable substances from the maternal blood and rejecting unsuitable or harmful compounds; also that food radicles to be so assimilated can be broken up into simpler compounds by the chorionic epithelium.

The mechanical theory supposes that the placenta acts as a purely passive and permeable membrane through which food substances and gases in solution pass according to the physical laws of diffusion and osmosis.

The usual view is that both these factors operate; that soluble substances such as salts, glucose, and peptones pass to the fœtal circulation by simple diffusion, but that colloid substances are first of all resolved by the chorionic epithelium into their simpler elements, which are then absorbed by the placental villi and later resynthesised in the fœtal circulation.

The main function, then, of the placenta is to transmit to the fœtus oxygen and food radicles, and to excrete from the fœtal circulation CO_2 and other waste products of fœtal metabolism.

Between the fœtal and maternal circulations are placed the chorionic epithelium, the mesoderm of the chorionic villi, and the endothelium of the chorionic blood vessels, and the problem before investigators is to find out by what means the barrier between the two circulations is passed.

It is to be remembered also that during the first half of pregnancy the chorionic epithelium consists of a syncytial and a Langhans' layer, while in the second half the latter layer disappears and the former becomes progressively thinner.

There is no reason to suppose that prenatal physiology is essentially different from post-natal physiology; it is merely modified by local circumstances. The fœtus is kept at a uniform temperature by its bath of liquor amnii, hence comparatively little heat production is called for. Fœtal movements are slight and respiratory movements do not occur; food is, so far as we know, absorbed already digested; therefore the necessity for energy production is slight. On the other hand growth occurs apace, and so the demand for nutrition is relatively great.

Placental Excretion.

The recognition of the placenta as an organ of excretion is of much later date than its recognition as a medium for fœtal assimilation. The fact, although suggested in 1848 by Harvey and McGillivray, was first experimentally proven by Savory ten years later. He injected strychnine into fœtal kittens, rabbits and bitches, while the placental circulation was intact, and the mother died in each case in convulsions. This demonstrated clearly that the strychnine passed through the placenta to the maternal circulation. Control tests in which the umbilical cord was ligatured produced convulsions in the fœtus but not in the mother.

Similar results were obtained by Gusserow, while Preyer obtained like results with nicotine, hydrocyanic acid, and curare, and Lanois and Brian with methylene blue. Methylene blue would not, of course, be toxic to the parent and fœtus as in the case of the others—alkaloids and HCN. Zweifel made the important observation that in maternal asphyxia, fœtal asphyxia also occurred, due to abstraction of oxygen from the fœtal circulation through the placenta.

The question now arises as to whether the passage of fœtal waste products through the placenta occurs by simple diffusion, or as the result of vital activity of the chorionic epithelium, and our knowledge in this respect has been augmented by the important researches of Slemons and his fellow workers. His deductions were made as the result of the examination of fœtal and maternal blood at birth, *the specimens being taken simultaneously.*

Urea, the most important substance in this respect, was found in 16 cases in a concentration of 10.5 mg. per 100 cc. in maternal blood, and 10.4 mg. in the fœtus; in nephritis, in which the urea content of the maternal blood is raised, a similar rise occurs in the fœtal blood.

He says: "The evidence is conclusive that the placenta takes no active part in the elimination of fœtal urea, but behaves as a semi-permeable membrane."

Similar results were obtained in the case of ammonia and uric acid, and in the case of creatinine and creatine he confirms the previous work of Hunter and Campbell, and Plass, that the concentration is similar in fœtal and maternal blood.

He explains the passage of carbon dioxide similarly. These waste products are later excreted by the maternal kidneys, and so a mechanical and continual purification of the fœtal blood occurs.

Slemons concludes that ". . . . we are confident of the passive *rôle* of the placenta in the transmission of all the nitrogenous waste products. They enter the maternal circulation as freely as if the placenta did not exist, and ordinarily the estimation of the quantity of them in the mother's blood holds valid for the blood of the fœtus."

Savarè, however, in 1907, demonstrated the presence of a deaminising ferment in the placenta by which the amino group of the amino acids is converted into ammonia. He regarded this as affording evidence of a vitalistic action on the part of the placenta in breaking down excreted products of protein metabolism into simpler bodies.

The suggestion that an internal secretion is elaborated by the chorionic villi to regulate fœtal excretion has never been supported, and in 1915 Döderlein could say no more than that fœtal waste products make their way to the placenta and through it reach the maternal circulation.

Oxygen and Carbon Dioxide.

The umbilical arteries contain venous blood and the veins arterial blood. The blood is oxygenated in the placenta and returns aerated to the fœtus after losing its CO_2. In proof of this the blood in the vein is found to be of lighter colour than in the artery, while Zweifel demonstrated spectroscopically the presence of oxyhæmoglobin in the former, and Cohnstein and Zuntz have obtained similar findings in the sheep.

Jellett and Madill state that if the cord be compressed during labour respiratory movements of the fœtus at once occur, due to venous stimulation of the respiratory centre in the fœtal medulla, but no actual proof of this statement is quoted. It is usual in this

respect to compare the placental with the adult pulmonary circulation, but the comparison is not accurate, as in the post-natal alveoli is air, while in the intervillous spaces the oxygen is not free, but is in chemical combination with the hæmoglobin in the maternal red blood corpuscles.

The process is actually one of internal or tissue respiration.

The actual process by which the oxygen and carbon dioxide are carried across the placenta has not yet been determined.

Protein Metabolism.

The products of protein digestion are absorbed by the bowel in the form of amino acids by the vital activity of the epithelial cells lining the bowel mucosa. Until recently amino acids were not demonstrated in the general circulation, and the prevalent supposition is that proteins are absorbed by the vital activity of the chorionic epithelium.

It is recognised that the increase in fœtal weight is, in all probability, due to protein assimilation, and that the proteins reach the fœtus *via* the placenta. Fehling found that five per cent. of the fœtal weight was due to protein at the third month, but that at term the percentage was increased to 12. Again, Cameron and Soldner showed that the daily assimilation of albumin increased from 0.174 grm. at the fourth month to 4.79 grms. at term. Also experiments (Sillevis) have shown that the daily nitrogen intake exceeds the nitrogen excretion; the difference represents the amount retained each day by the fœtus.

In the human placenta most attention has been given to the decomposition products of proteins. Matthes claimed to show the presence of albumose in the placenta, but this finding is not generally accepted, although supported by Hofbauer. Purine bases, uracil and choline have similarly been demonstrated (Rieländer), also leucine and tyrosine (Basso). These findings have been taken to indicate an active metabolism of protein in the placenta.

Important work in this respect has been done by Lochhead on the placentæ of the sheep, cow and rabbit. This observer quite failed to demonstrate the presence of either albumose or peptone in the placenta. He also points out that the intestinal enzymes which hydrolyze proteins into amino acids are extra-cellular enzymes secreted into the lumen of the gut; but he could find "no extra-cellular proteolytic enzyme in the maternal or fœtal part of the placenta."

He proved, however, that the placenta is not the barrier to large protein molecules that it is supposed to be, by injecting egg albumin into the mother and recovering it unchanged from the fœtal blood.

Opposite results with ox serum are explained by the fact that the proteins of ox serum closely resemble the normal serum protein of the rabbit, and are metabolized by the trophoblast.

He concludes that normally the maternal serum proteins are not passed unchanged to the fœtal circulation, but that the placenta itself elaborates, from the proteins in the maternal circulation, the proteins necessary for the fœtus; in this way he likens the placenta to a ductless gland.

However, he admits that in the later stages of pregnancy ". . . . when the placenta degenerates increasingly and the maternal and fœtal circulations are practically separated only by a capillary wall," maternal serum protein may pass unchanged into the fœtal circulation by simple diffusion across the thin barrier present at this period.

Slemons approached the subject from the point of view of chemical analysis of simultaneous specimens of the fœtal and maternal blood. By employing Folin's method in 35 cases he found an average of 25.2 mg. of non-protein nitrogen per 100 cc. of maternal blood, and 24.9 mg. in the case of the fœtus.

He says: " The equality of the non-protein nitrogen in maternal and fœtal blood indicates that its various constituents . . . . pass freely through the placental partition." He explains this on the grounds of simple diffusion.

But on similarly examining the amino acid content of fœtal and maternal blood by van Slyke's method he found an excess of about 2 mg. per 100 cc. in the fœtal plasma, and in this case he admits that some process must be added to simple diffusion in order to regulate this higher content. For this he accepts the term " absorption " first used by van Slyke. This indicates that the placenta is capable not only of absorbing the amino acids but also of preventing their departure from the fœtal circulation.

Fat and Lipoid Metabolism.

The manner, or the form, in which fats are transmitted through the placenta is not yet definitely known, although there has been much theorizing on the subject. Indeed, recent researches seem to indicate that fat does not pass through the placental barrier at all.

Fehling, and later Michel, analyzed the fœtus at various stages of gestation. At $2\frac{1}{2}$ months there was present only a trace of fat, at the fourth month there was 0.03 per cent., at the seventh month 1.82 per cent., while at term the percentage had increased to 11.75. Thus an increasing relative and absolute amount of fat is laid down in the fœtal tissues as gestation proceeds—a well-known clinical phenomenon—and the points for investigation are whether it passes unchanged from maternal to fœtal circulations, whether it is acted

on and changed into simpler substances by some agent such as the chorionic epithelium, or whether it is formed in the fœtal blood or organs by the synthesis of substances other than maternal fat.

The study of fat in the placenta is rendered difficult by the fact that it may appear here, as elsewhere, as an infiltration or as a degeneration. In the human placenta fat was first demonstrated by Apfelstedt and Aschoff in 1896. They found it in the syncytium and Langhans' layer, also in the decidual cells near the villi. These findings were confirmed by Eden, who also found it in the stroma of the villi, and it has been found in the capillary walls.

The amount of fat in the decidua increased up to the sixth month, but it was still demonstrable at term, and this is generally held to be a normal and not a pathological condition.

Eden is of opinion that the fat here is nutritive for the fœtus. But in the syncytium fat is present mainly in the perinuclear area (Eden), and its absence from the superficial parts of this tissue led Hofbauer in 1905 to suggest that fat in the maternal blood was first broken down into glycerol and fatty acids, which were re-synthesized by the syncytium, transferred to the fœtal circulation in a soluble form, and deposited as necessary in the liver or other fœtal organs or subcutaneously. So far as the writer knows no proof of this hypothesis has ever been offered, and the results of vital staining for maternal and fœtal fat which were offered to support it will be explained in quite a different fashion.

In the placenta of the rabbit, fat metabolism has been investigated by Eden, Chipman and Maximow. In the fœtal placenta fat is found only in the trophoblast, and especially where that is in contact with maternal blood or decidua. It increases in amount up to the 16th day, and by the 23rd day has disappeared. It is present in the maternal placenta, but first appears in decidual cells nearest the trophoblast, which probably secrete the fat. Towards the end of gestation it disappears here also.

The interesting fact is to be noted that the greatest laying down of fat in the fœtus does not occur until after its disappearance from the placenta.

Thiemich in 1898 declared that fœtal fat was not derived from fat ingested by the mother. He experimented on dogs, which he fed during different pregnancies with different fats, but in each case the composition of the fœtal fat was the same.

Slemons approached the matter again *via* simultaneous blood examinations of fœtus and mother. He found a considerable disparity between the fat and lipoid content of the two circulations, and came to the conclusion that " . . . . we may not entertain the possibility of fats passing through the placenta in the way other substances do." He quotes the vital staining experiments of Gage,

Mendel and Daniels. These observers injected pregnant rats with Sudan iii and found in every case that the maternal fat was stained and the fœtal fat unstained. These results would appear to dismiss the possibility of fat being carried across by an enzyme, as has been suggested, and his deduction that " . . . fat is not . . . . contributed by the parent to her offspring " would appear justified. These results bear out the opinion of Thiemich.

What is fœtal fat derived from if not from maternal fat? The answer would appear to be carbohydrates, with which the fœtus is well supplied and from which we know fats may be formed.

Regarding lipoids very little is known. Bienenfeld reported in 1912 that he had found large quantities in the placenta in the earlier months of pregnancy, but that the amount decreased later on. He found the lipoid content very high in eclampsia.

Carbohydrate Metabolism.

Claude Bernard in 1859 first demonstrated the presence of glycogen in the placenta of the rabbit. The importance of this observation was not realised for some years, but latterly much investigation has been carried out on the subject of carbohydrate metabolism in the placenta.

In 1907 Driessen showed that in the premenstrual period glycogen is deposited in considerable quantity in the endometrium, probably in anticipation of a pregnancy. Bernard showed that the amount increased and later decreased during pregnancy, and concluded that in the first half of uterine life the placenta carried on the glycogenic functions afterwards assumed by the fœtal liver. Later work, *e.g.*, by Godet and Maximow, has only confirmed this. Most of the investigation in this respect has been done on the placentæ of rabbits, which are rich in glycogen.

Chipman investigated histologically an age-series in the rabbit, and showed that glycogen was present always in the maternal and never in the fœtal placenta. It reached its maximum about the 16th day, after which it steadily diminished, and at term only a few granules were to be seen. In the fœtal liver he found glycogen first on the 22nd day, after which it increased rapidly in amount up to term.

Lochhead and Cramer approached the matter chemically and obtained similar results. They separated the fœtal from the maternal placenta, and found in the former only the smallest amount (proximal glycogen) which really represents the glycogen in the decidual papillæ separated mechanically. In the maternal placenta the amount increases up to the 18th day, when it represents 5.5 per cent. of the placental weight. After the 22nd day the amount decreases until at term it represents 1.1 per cent.

In the fœtal liver traces of glycogen were found at the 18th day; up to the 24th day the amount was very small; but after that the increase was rapid until at term the liver stores half the fœtal glycogen. Therefore it is only after the 24th day that the liver is capable of assuming its glycogenic function which, prior to this, has been carried on for it by the placenta. There would appear to be no doubt but that glycogen is progressively absorbed by the trophoblast, especially after the 24th day, and transferred to the fœtus, where it is stored in the liver. But no glycogen can be demonstrated histologically in the trophoblast. This is explained on the assumption that the glycogen is transformed into sugar by an enzyme before absorption, and that it is built up again into glycogen in the fœtal circulation and deposited where required. The valuable observation was made that in glycerol extracts of such a placenta as the rabbit, where glycogen was much in evidence, a powerful glycolytic enzyme could be separated, but that in the ruminants, where glycogenic changes were almost *nil* the enzyme action is likewise almost *nil*.

These deductions would appear to reverse the generally accepted findings of Cohnstein and Zuntz, who claimed to show that the transference of glucose from the maternal to the fœtal circulation was by simple diffusion. But they proved only that it diffused when a maternal hyperglycæmia is present. Again, Paton, Kerr and Watson showed that the sugar in the circulation of the fœtal rabbit was lævulose, while that in the maternal circulation was dextrose, thus proving that a considerable chemical change had been brought about by some agent, probably the chorionic villi. In the human placenta glycogen was demonstrated by Langhans in the early months of pregnancy in the decidual cells, in the trophoblastic proliferations, and in the mesoblast, and Driessen found it in the decidua in the first month of pregnancy. But at any time the amount is much less than in rodents, according to Cramer only about 0.08 per cent. Recently, however, Clogne, Welti and Pichon estimated the percentage of glycogen in the placenta at 0.60 to 1.66.

So far it has to be presumed that the glycogen in the placenta is formed from the glucose in the maternal blood: that it is transformed into glucose as required by the placental enzyme: and that it is deposited in the fœtal tissues, especially the liver, and again drawn on as required in the shape of glucose.

Della Chiage, as the result of experimental investigations on the pregnant bitch, came to a similar conclusion, that the placenta possesses amylogenetic and amylolytic functions for the benefit of the products of conception.

Now it has been shown that in the human placenta the amount

of glycogen stored is almost infinitesimal, therefore it is reasonable to assume that the greater proportion of carbohydrate supply to the fœtus comes, not from glycogen in the placenta, but from glycose in the maternal circulation.

Slemons investigated this subject again by the method of chemical examination of fœtal and maternal blood. Out of 24 cases, the glucose value was identical in five, and the mean for the mother was 0.132 per cent., and for the fœtus 0.115 per cent. He concludes that such findings indicate a process of diffusion, and that the slightly higher maternal value would promote a steady flow of glucose towards the fœtus.

All observers agree as to the great importance of carbohydrate to the growing fœtus. The katabolism of glycogen almost certainly furnishes the energy necessary for the formation of new tissues. Hasselbach studied the respiratory quotient of the new-born baby and found it unity, thus showing that carbohydrate is the source of the child's energy. But Benedict and Talbot in 105 cases found the respiratory quotient 0.8, indicating that at birth carbohydrate was not the only source of energy.

Carbohydrate therefore supplies the power to build up the protein into the fœtal tissues. Again, according to Slemons and his colleagues, carbohydrate is also the source of fœtal fat.

Iron and Other Salts.

Iron is probably the most important of the inorganic constituents from the point of view of fœtal nutrition, as it is the basis of hæmoglobin; yet our knowledge regarding its transmission from mother to fœtus is very fragmentary. The main source of iron for the fœtus is maternal hæmoglobin, but another suggested and less important origin is maternal reserve iron, while nucleo-protein is another possible but less likely source.

The possible processes of assimilation which spring to mind are the ingestion by the trophoblast of normal maternal erythrocytes or of degenerated erythrocytes, the contained iron in either case being absorbed and used. A third possibility would be lysis of the maternal erythrocytes in the intervillous spaces with absorption by the trophoblast of the liberated iron. In the latter case the iron might be absorbed in *organic* or *inorganic* combination.

In the rabbit ingestion of healthy or degenerated erythrocytes has not been shown to occur. Such as appeared to be in the syncytium have been shown to lie in decidual islets surrounded by trophoblast.

Chipman showed the presence of inorganic iron compounds in the placenta of the rabbit by staining with an aqueous solution of

hæmatoxylin. At the 14th day granules are plentiful in the mesoblast of the villi, especially near the decidua: they increase for a day or two and then diminish, but never quite disappear even at term. Between the 16th and 20th days a few granules are seen in the trophoblast: again from the 16th day they are present in the decidual cells which approximate to the fœtal placenta, and later when these degenerate after the 24th day irregular black patches of iron granules are found here.

Few if any conclusions can be drawn from such data. It is possible that the iron has been absorbed in organic combination which does not show by the stain, and that later on it does show after deposition in the chorionic mesoderm. Nothing is known regarding its transit to the liver, which is the main fœtal storehouse for iron.

In man Bryce and Teacher could not confirm the earlier opinion of Peters that maternal erythrocytes were present in the early trophoblast.

Bonnet has shown that the syncytium gives the eosin reaction of hæmoglobin at the points where it comes into contact with extravasated blood.

Veit and Scholten showed that placental extracts experimentally produce hæmolysis, but it has not been shown that any such process occurs in the body.

Hofbauer found iron in loose organic combination in the *deeper* layers of the syncytium in early pregnancy: in the mesoblast the granules were scanty. He explained these appearances on the assumption that while passing through the superficial layer of the syncytium the iron is in firm organic combination so that it does not take on the stain: that this firm combination in the deeper layers becomes broken down so that the stain is taken on, and that again in the deeper layers of the mesoderm a firm organic combination is formed, before absorption by the vessels, which does not stain. In support of this last point he could never detect any stained iron near the chorionic vessels.

In later pregnancy these appearances were hardly to be seen.

Iron is stored mainly in the fœtal liver but also in other organs. It diminishes rapidly after birth (Bunge), probably being called on to supplement the insufficiency of iron in the colostrum and milk. Thus the liver of a rabbit contains 18 mg. of iron per 100 mg. body weight at birth, but in 24 hours this amount is reduced to 3.2 mg. (Feldman).

Calcium salts for the fœtus are probably derived from maternal calcium. Thus dental caries may occur in pregnancy from the loss of calcium fluoride (Terrier), and osteomalacia is another indication of withdrawal of calcium from the maternal bones.

Phosphates and sulphates are most likely derived from protein ingested by the mother.

It is generally accepted that the interchange of organic salts of calcium, magnesium, sodium and potassium takes place by simple diffusion.

Insoluble substances such as cinnabar or barium sulphate when introduced into either fœtal or maternal circulations do not pass from one to the other. But many substances in solution have been experimentally administered to the mother and found in the fœtal blood. Mayer in 1817 first demonstrated this with cyanide of potassium, and since then similar results have been obtained with iodide and bromide of potassium, phosphorus, salts of mercury, copper, arsenic, lead, carbolic acid, sodium salicylate, quinine, atropine, morphine, urea, alcohol, chloroform and ether.

Kelner reported in 1907 that of 73 substances examined, 43 were found to pass readily through the placenta by simple diffusion (Slemons). Many of these were toxic and included strychnine, hydrocyanic acid, nicotine, curare, physostigmine, phlorhizin, methylene blue, and adrenaline. Nicloux has well summarized the known facts in this respect up to 1909.

Bacteria and Toxines.

There has been much discussion on the subject of the placenta acting as an efficient filter against bacteria, and the conclusion generally arrived at is that a part from some lesion transmission of bacteria but rarely occurs. The fact of children being born pock-marked is no evidence in the affirmative, as at present we do not know the cause of smallpox.

The organisms of anthrax, pneumonia, typhoid and relapsing fever, and pyogenic organisms may rarely be transmitted (Lubarsch). In tuberculosis Hauser was able to find only 18 cases of placental or fœtal infection, while Whitridge Williams has never found tuberculosis of the fœtal placenta even in cases when the decidua was affected.

In typhoid fever, however, the organism has frequently been demonstrated in the fœtus by Spreier, Lynch, and Hicks and French. The latter observers isolated the organism from the fœtus in 10 out of 30 cases. On the contrary, in malaria it has never been shown that the specific parasites can enter the fœtal circulation through the placenta.

It has been shown, as might be expected, that many toxines and antitoxines can be transmitted through the placenta, especially those of diphtheria, tetanus and typhoid. One would think that such transmission would be by osmosis or filtration, but Wegelius

has demonstrated a selective action of the syncytium in this respect. He induced immunity in the mother and was able to show that in certain cases the antibody titre was higher in the fœtal than in the maternal serum.

This subject is excellently summarized by Whitridge Williams in his text-book.

Ferments and Vital Staining.

The ferment content of the placenta has been investigated by many workers with indefinite results. It must be remembered that unless the organ be examined in a fresh condition, post-natal autolysis will occur to a considerable extent with the production of enzymes. The matter is well summarized by Lochhead in Marshall's "Physiology of Reproduction." He classifies the various enzymes according to their chemical action as follows:—

(1) Proteolytic enzymes: these have been demonstrated by Ascoli in 1902, and later by Bergell and Liepmann, Savarè, and others. Lochhead was able to demonstrate in the placenta of the rabbit an enzyme with a powerful hydrolytic action on glycogen, and in ruminants in which glycogenic changes in the placenta are infinitesimal the enzyme action is insignificant. This bears out the work of Botazzi, who showed that placental tissue can transform glycogen into maltose. Savarè, on the other hand, considers that the transformation of glycogen to sugar is due to the action of an enzyme in the blood; but in ungulate placentæ there is plenty of blood but no enzyme action, hence the view is maintained that this change is essentially due to enzyme action. No lipolytic enzyme has yet been demonstrated in spite of Hofbauer's showing that such an enzyme splits fat into glycerol and fatty acid prior to absorption.

(2) Oxidative enzymes. Oxidation of aldehydes in the placenta has been claimed by Hofbauer and by Ferroni, while v. Fürth and Schneider state that tyrosine is similarly oxidized with the production of a dark pigment—melanine. This would point to the presence of tyrosinase in the placenta.

(3) A deaminising ferment. This has been claimed by Savarè and has been referred to above. By it the amino group of the amino acids is supposed to be transformed into ammonia.

(4) Decomposition of peroxides has been shown by Charrin and Goupil. They demonstrated this by the guaiacol reaction, in which the hydrogen peroxide was reduced by the placental tissue, the nascent oxygen oxidising the guaiacol and producing the typical colour reaction.

In rabbits Frank attempted to determine whether the placenta acts as an accessory organ of metabolism for the fœtus by investigating any differences between the functionating and non-

functionating placenta, but his results were not conclusive in either direction.

Goldman in 1912 used the method of vital staining to investigate ferment action in the placenta. An acid stain, trypan blue, was injected subcutaneously into pregnant rabbits and guinea pigs, and the uterus was found to be stained first, later the yolk membrane, and lastly the placenta. He concluded like Slemons that the main action of the placenta is that of a mechanical filter.

Wislocki also employed vital staining, and found that traces of the stain might pass into the amniotic fluid and stain the fœtus. Using Indian ink, he found the granules too coarse to stain the placenta or membranes, as they were not taken up by the cells.

It is to be remembered here that the primary implantation of the ovum and the later formation of the intervillous blood spaces is generally looked on as being due to the eroding action of a ferment secreted by the syncytium.

Internal Secretion

Halban in 1905 was the first to postulate the presence of an internal secretion in the placenta, and since then much investigation has been carried out on the subject and a great deal of controversy has raged round the point. His theory was that the chemical products of both the ovary and placenta produce hyperæmia and uterine menstrual (or decidual) reaction, and both exert an influence on the breast; that the placenta assumes during pregnancy the trophic protective power over the genital organs normally possessed by the ovary.

Lane-Claypon and Starling investigated the effects of placental extracts especially on the mammary glands and concluded that the hypertrophy of these glands during pregnancy was due to "the action of a specific chemical stimulus produced in the fertilized ovum." They also stated that lactation was brought about by the withdrawal of this substance. But they also concluded that there were other sources of this stimulus besides the ovum.

Foà came to similar conclusions, but the work of Hill, O'Donoghue and Heape points to the corpus luteum more probably as the source of the hormone. Blair Bell sums up the matter thus: ". . . . however stimulating the fœtal hormone may be in regard to the mammary activity . . . . it is neither specific nor essential, for various hormones, mechanical stimuli, and other exciting causes such as pelvic tumours, not infrequently arouse mammary activity, even in the absence of pregnancy and parturition."

Dixon and Taylor in 1907 claimed a vasoconstrictor effect for placental extracts, the action being similar to adrenaline but the composition different, but Rosenheim showed that this effect was

brought about by amino acid decarboxylation products formed in placentæ not properly preserved.

Frank disregarded the work which has been quoted on account of the fact that aqueous solutions had been used and were unreliable. He and Rosenbloom used the concentrated fat soluble fraction of placental extracts and obtained fairly uniform reactions. They injected this extract subcutaneously in the rabbit and concluded that the potent substance (1) is a lipoid, or (2) is a protein in conjunction with a lipoid, or (3) as suggested by Herrmann, is simply carried along by the lipoids, and that after the lipoids have been removed the remainder contains the active substance.

As a result of experiment and observation Frank concluded that :—

1. Experimental work of last decade proves Halban correct in ascribing to the placenta an action upon uterus and breasts.
2. Placental extracts (mainly the lipoid fraction) rapidly induce hyperplasia of the uterus and breast (gland tissue and nipples) in castrated and in non-castrated animals.
3. The chemical substance which induces these changes is thermostable, very resistant to strong alkalies and acids, and completely soluble in 95 per cent. alcohol.
4. The substance appears identical in its physical, chemical and biological properties with a similar substance obtained from corpus luteum.
5. The substance can exert its influence in the absence of the thyroid, adrenals, pancreas, or in the absence of thyroid and adrenals combined.
6. In view of the apparent identity of corpus luteum and placental substances, the question arises whether the placenta acts merely as a storage reservoir for corpus luteum secretion during the second half of pregnancy or whether the placenta elaborates a hormone of its own.

According to this view, then, the only hormone action of the placenta is due to its assumption of the function of the corpus luteum in the latter part of pregnancy.

Frank's summing up is worth recording *in extenso* :—

"The main function of the placenta unquestionably pertains to the exchange of nutritive substances from mother to fœtus and the elimination of waste products of the fœtus in a reverse direction. The fulfilment of this function accounts sufficiently for the histological structure of the placenta, which is characterized by a labyrinth of sinuses lined by fœtal cells. Therefore it does not follow in this instance because an intimate relationship between

blood channels and cellular components exists, a distribution usually characteristic of glands of internal secretion, that the placenta must be a ductless gland. If, further, the apparent identity of composition and action of corpus luteum and placental secretion is considered, and the well-known abhorrence of the organism to unnecessary duplication of function is kept in view, the question may logically be propounded whether the placenta does not act merely as a storage reservoir for the active principle elaborated by the corpus luteum during the earlier part of pregnancy. During the latter half of gestation the yellow body histologically has the appearance of an involuting functionless gland. No proof in substantiation of this hypothesis can as yet be adduced."

These experimental data have been applied clinically by a number of workers, mostly in Germany. Guggisberg found the combination of placental extract and pituitary (both subcutaneously) markedly increases the strength and frequency of the pains in the first stage of labour. Puppell concludes that (1) placental extract can be used to improve the pains in any stage of labour, and (2) intramuscular injection has a good effect upon all menstrual disorders *e.g.*, dysmenorrhœa and amenorrhœa due to hypofunction of the uterus.

Halban stated that, although the placental hormone stimulated the mammary tissue to hypertrophy with colostrum secretion, the effect was inhibitory to lactation. This finding has been in general confirmed by experimental and clinical observation by many workers. Lately Stimson and Frankl have put forward respectively clinical and experimental evidence to support this view, and the latter concludes: "This ability of the placenta to prepare during pregnancy the mamma for its secretory function but at the same time to inhibit actual function has its perfect analogy in the function of the corpus luteum. Also the yellow body through its hormone prepares the endometrium for menstruation by causing the typical premenstrual swelling, but only the involution of the corpus luteum, which follows the death of the ovum, determines the appearance of the menstrual flow."

It is therefore only after the removal of the placental inhibition, *i.e.*, after parturition, that milk is secreted in the breast, and this work merely supports the earlier deduction of Halban, Lane-Claypon and Starling.

Hammett and McNeile fed 300 nursing mothers on desiccated placental extract, gr. 30 daily, and found no visible mammary difference compared with cases not so treated, no increase in milk secretion, and only slight changes in the composition of the milk. But the infants definitely increased in weight compared with the

controls, and so they conclude that the only ground on which the placenta can be regarded as an endocrine gland is in the production *in utero* of some substance which stimulates fœtal growth.

Blair Bell refuses to acknowledge the placenta as an organ of internal secretion for the following reasons: (1) it has a very short phylogenetic history and is a structure of late mammalian origin; (2) it is a fœtal structure; (3) it is merely a temporary occupant of the uterus.

He says: " . . . . the placenta of all structures in the animal economy should never have been chosen for a seat among the elect."

So far as the writer knows, the foregoing is a more or less complete statement of our knowledge regarding the physiological processes which go on within the placenta, and unless some glaring omission has been made we are forced to the conclusion that we know almost nothing definite regarding this special branch of physiology.

Beyond the accepted fact that the placenta is the organ of alimentary and excrementitious exchange between the mother and fœtus we cannot go a single step without falling into a quagmire of dispute and doubt. There is obviously an enormous field here for obstetrical and physiological research.

It was stated previously that the main existing theories regarding placental function were two in number: the mechanical and the vitalistic. Reviewing the work done on protein, fat and carbohydrate transmission, it was shown that in the case of each of these food constituents, views differ. On one hand it is held that a vital action of the chorionic epithelium, especially of the syncytium, is necessary to effect the transmission, usually by the action of some hydrolyzing enzyme which breaks down the food constituent into simpler substances. The other, and generally the more recent, view supported strongly by Slemons and his fellow-workers, is to the effect that no such vital action is called for, that the passage of alimentary material and oxygen from the maternal to the fœtal circulation across the placenta can be explained satisfactorily by the mechanical laws of osmosis and diffusion. It has to be remembered that the surface area available for either of these processes is very large. Dodds has estimated it at seven square metres.

The structure of a villus becomes simplified as pregnancy progresses. By division the calibre of an individual villus becomes smaller; the Langhans layer of epithelium disappears and the syncytium becomes very thin, resembling endothelium; the chorionic blood vessels also become relatively dilated, in some cases almost completely filling the villi. The result of these structural

changes is that the barrier between the maternal and fœtal circulations is finally represented by a thin layer of syncytium and chorionic mesoderm, a thin membrane in fact through which osmosis and diffusion would much more readily occur than in the case of the more complicated villi of early pregnancy.

In this connexion it is to be remembered that Slemons carried out his fœtal and maternal blood examinations after full-time birth, and while his results would appear to show that *at the end of pregnancy* the placenta acts as a mere mechanical filter, it does not at all follow, as he points out, that in early pregnancy the action is not that of an organ with a much more specialized function. In support of this view it may be noted that degenerative changes occur towards the end of pregnancy which would not occur in an actively functioning organ.

Further, when the ovum is small and the embryo still smaller, and when the food requirements of the latter are almost infinitesimal, the trophoblast is well developed. But as growth occurs and the call for nutriment becomes greater, the trophoblast progressively degenerates and the villi become simplified in structure in the manner indicated.

Finally, the fact that the fœtus may be born prematurely and survive shows that towards the end of pregnancy the placenta is not an absolutely vital organ at that time.

This view, that the placenta acts as a vital organ in the first half of pregnancy and that the vital function is later replaced by a physical function, is put forward by Lochhead, who believes that in early pregnancy the trophoblastic epithelium performs the assimilative functions of the various fœtal organs which are not, as yet, sufficiently developed to functionate on their own, but that later, when they are able to functionate, the placenta assumes more and more the *rôle* of a passive membrane.

He says: "What is the difference in the early stages of pregnancy, when the trophoblast is morphologically well-developed? We believe that at that time the extra-embryonic ectoderm has less to do with the quantity, and more with the quality, of the material transferred to the new organism. It does not act merely by the physical laws of diffusion and osmosis. At this stage the cells of the ovum have not yet departed widely from a general type, and the active trophoblast would seem to spare the embryonic cells much of the work of the elaboration of the food materials, and thus conserve their energies for their own multiplication and differentiation. As the cells gradually depart further and in different directions from the original type, each cell requires to expend less energy on its own specialization; at the same time the nutritive wants become more varied, and each cell requires to expend more energy on

the synthesis of its individual protoplasm. As the duties of selection and anabolism are more and more taken up by the cells themselves, the trophoblast has a less important part to play, and it undergoes a gradual process of degeneration."

Apart from assimilative functions it will be noted that it is far from generally accepted that the placenta is an endocrine gland. The earlier work of Halban has not gone unchallenged, and later work has, if anything, failed to substantiate Halban's views, while no one has until recently claimed to have isolated the supposed hormone.

Fränkel and Fonda, however, in 1923 isolated a hormone both from the placenta and corpus luteum. The process of extraction is long and complicated, and the substance is described as a viscous, light yellow syrup. Analyses indicated the formula $C_{32}H_{52}O_2$. Various combinations were obtained. The distilled product was optically inactive and lost some of its activity during distillation. From the corpus luteum, besides the above substance, various lipoids were extracted.

Finally, the old question again comes to be considered, does the material provided for the growth of the ovum come from the mother's tissues or from her food? This question can arise only after the first month of gestation, when the fœtal blood vessels have penetrated the chorionic mesoderm. Before this the ovum is a pure parasite on the mother, living progressively on the cells of the discus proligerus, the tubal and uterine secretion, and the débris of uterine mucosa produced by penetration of that structure by the ovum.

The general view is that throughout pregnancy the ovum plays the part of a parasite, but experimental investigation has failed to prove this.

The experiments performed aim at determining the nitrogen gain or loss of the mother during pregnancy. Working on bitches and rabbits Jägernoos concluded that in conditions of starvation the fœtus does draw its nourishment from maternal tissues, while ver Eeke found in some cases one result and in other experiments the other.

But later workers have in general found either no maternal protein loss or an actual protein gain. The finding that in a number of cases there was a protein loss at the onset of pregnancy, which was converted into a gain as gestation proceeded is in agreement with the statement above regarding the parasitic activity of the ovum in early gestation.

The recent work of Slemons, Wilson and others, goes to support the conclusion that in ordinary circumstances the fœtus draws its nutrition from the food ingested by the mother and not from her

tissues. Slemons concludes that: " . . . . there is no diet specifically adapted to the state of pregnancy; the prospective mother may exercise the same freedom as anyone else in the selection of food." As the fœtus assimilates only as much nutriment as is necessary for its growth, there is no object in the mother taking a greater amount of nourishment during pregnancy than at other times. Such overfeeding is likely to result only in gastro-intestinal derangement.

In concluding this review, the writer would like to acknowledge the kindly help and useful suggestions that he has received from Mr. John Pryde, B.Sc., Lecturer in Physiological Chemistry in the Welsh National School of Medicine.

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CLINICAL REPORTS.

Diphallus in the Female.

By

PROFESSOR BLAIR BELL, B.S., M.D. (Lond.)

(From the Department of Gynæcology and Obstetrics, University of Liverpool).

Bifid penis, although extremely rare, has been described and illustrated by various writers[1, 2, 3]; but, so far as I can discover, hitherto no case has been recorded in which an homologous condition has been seen in the female sex. The following case may, therefore, be unique in this respect; yet it is probable that diphallus, however rare in both sexes, occurs in women as frequently as in men, but, owing to the configuration of the parts, is much more likely to be overlooked in the former.

History of the case. C.R., æt. 14 years, has not commenced to menstruate.

Since early childhood it has been noted that the patient has only partial control of urination: during the daytime there has been continuous dribbling of urine; at night the bed has always been wet from the same cause. There has been a painful sense of scalding of the skin of the vulva.

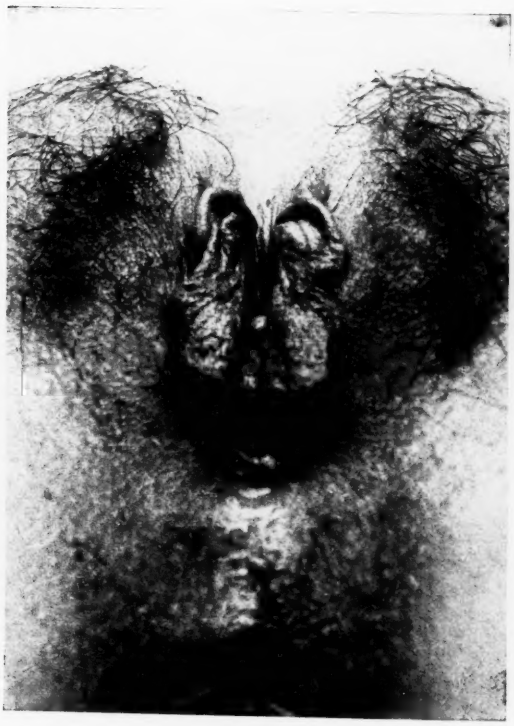
Examination of the patient. The patient is well developed for her age. The breasts are normally formed. The appearance of the vulva is abnormal (description below).

With the patient under the influence of an anæsthetic, a further examination was made. The vagina was found to be normal; but the urethra admitted easily a little finger, the passage being of considerable size.

On bimanual examination the uterus was felt to be of normal shape, but infantile in character. A spindle-shaped ovary was palpable on the right side.

Radiographic examination of the pelvis revealed no abnormality.

Several unsuccessful attempts were made to construct a functional urethra. The condition of incontinence has, however, not been improved. Further operative procedures have been refused by the parents.



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Description of the abnormality. The general appearance of the vulva is shown in the figure. This photograph was taken after an attempt had been made to form a normal urethra. It will be noted that at that operation the outlet of the vagina was enlarged to secure adequate room.

It will be observed that there is complete separation of the nymphæ, clitorides and their preputia, and that there is a grooved gutter—similar to that seen in certain cases of intersexuality—running in the mid-line across the lower part of the front of the symphysis to the upper aspect of the urethral orifice.

Developmental considerations. It is common knowledge that the genital tubercle, from which the phallus and inner genital folds are developed, "has its origin in bilateral elevations, due to proliferation of the underlying mesoderm, on either side of the anterior, or ventral, part of the cloacal membrane. These bilateral elevations soon fuse to form a single central outgrowth at this site. The genital tubercle reaches the superficial surface of the body by the outfolding of the ectodermal cloaca, whereby the roof of the ectodermal and floor of the entodermal cloaca—that is, the cloacal membrane—sinks down towards the body surface. It will be remembered that in the reptiles and lower mammals the genital tubercle and its derivatives remain within the ectodermal cloacal cavity, or depression.

The genital tubercle soon becomes differentiated into two parts—the phallus at the extremity, and the inner genital folds which extend from the phallus laterally and backwards towards the anal plate—that is, the posterior part of the cloacal membrane."[4]

Nature of Diphallus. There is no necessity to adopt the extreme view of Taruffi[5] that diphallus is a sign of fœtal duplication. In view of the method of development of the phallus, and in the absence of other evidence of duplication, it is, I think, more correct to consider this condition as being due to arrest of fusion, such as may occur in connexion with the genital passages; indeed, like incomplete fusion of the Müllerian ducts, diphallus in man may be regarded as an atavism, rather than an actual malformation, for in certain of the lower creatures these duplex states are normal.

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Hydatid Cyst causing Obstructed Labour.

By

PROFESSOR BLAIR BELL, B.S., M.D. (Lond.)

(From the Department of Gynæcology and Obstetrics, University of Liverpool).

This case is reported because of the comparative rarity of obstructed labour due to hydatid cysts.

In 1902 Franta[1] collected cases of hydatid cysts recorded in the literature in relation to pregnancy and parturition, and he described the result of his labours in three papers. The first dealt with dystocia due to hydatid cysts in the pelvis, of which he could only find thirty-six recorded instances, including the earliest, which was described by Meyer[2] in 1794. This case came under the care of Meyer in 1792. Labour was obstructed, so he performed Cæsarean section, and delivered a live child. The patient died 42 hours later.

In the second paper are recounted the cases, twenty-two in number, in which operation for removal of the tumour was performed during pregnancy.

The third contribution is concerned with the influence of pregnancy, parturition and the puerperium on hydatid cysts, and is of less direct obstetrical interest than the other papers.

The history of my case, the details of which are given below, is such that it may be placed in both categories covered by the first two of Franta's papers:

Mrs. M.F.O., æt. 24, secundigravida, was referred to me by Dr. J. Roberts, of Llanberis—a district not unknown in regard to the occurrence of hydatid disease among the inhabitants.

In her first confinement she had been attended by a midwife, who, when labour became obstructed, summoned Dr. Roberts, and he, finding a tumour in the pouch of Douglas, which he could not displace, performed craniotomy.

When the patient consulted me she had been pregnant for about 15 weeks. A vertical scar was noticed over the centre of the epigastrium, and I was told that an operation had been performed on the stomach when the patient was 12 years of age.

On bimanual examination I found a tumour which felt like a degenerated fibromyoma or a dermoid cyst attached to the posterior

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wall of the uterus and filling the pouch of Douglas. It was impossible to move the tumour apart from the structures to which it was evidently adherent.

I opened the abdomen two weeks later. When the uterus was raised and held forwards, it was seen at once that neither ovary was involved. The tumour was enucleated without difficulty from a mass of adhesions at the bottom of the pouch of Douglas. Subsequently, it was discovered to be a hydatid cyst (see figure); and a history was then obtained to the effect that Mr. Thelwall Thomas had operated for hydatid disease of the liver twelve years previously. From the appearance of the contents, it is probable that the cyst was not of recent development, but was contemporaneous with the hydatids which had been removed at the previous operation.

The patient made an excellent recovery and returned home. Ten days later abortion occurred. This was attributable, her doctor believes, to a " motor journey and excitement ".

Comment. In this case, labour had been obstructed in the first confinement, and craniotomy was performed. During the second pregnancy the cyst was removed successfully, but unfortunately abortion occurred after the patient had returned home. It may be presumed, however, that the operation was not the direct cause of the subsequent abortion.

With regard to the diagnosis, a correct prognostication was impossible in the absence of a true account of the previous trouble and of the operation performed. Even if this had been forthcoming, the real nature of the tumour on the pelvis could only have been put forward as a possible diagnosis, for fibromyomata and dermoid cysts, which may give similar physical signs are relatively common in this situation and often cause obstructed labour.

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2. Meyer (no initial in the original). Museum de Heilkunde, Zurich, 1794, ii, 211.

A Case in which 52 Fibroids were Enucleated from the Uterus of a Patient aged 24 years.

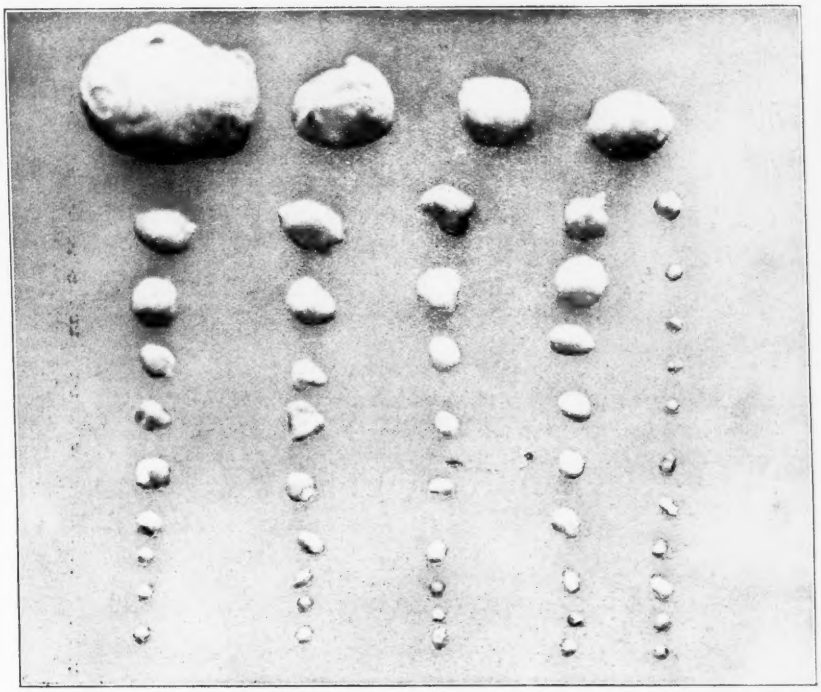
By

VICTOR BONNEY, M.S., M.D., B.Sc. (Lond.), F.R.C.S. (Eng.),
Assistant Obstetric and Gynæcological Surgeon, Middlesex Hospital; Surgeon, Chelsea Hospital for Women.

In October, 1924, a girl aged 24 years was admitted to Putney Hospital under Dr. Burnford on account of anæmia and debility. On examination, an abdomino-pelvic tumour was found, hard in consistence and irregular in outline, and for this I operated a few days later. On opening the abdomen the mass proved to be the uterus much enlarged by a number of fibroids impartially distributed throughout its substance. Having regard to her age, I performed myomectomy, enucleating 52 separate tumours from the uterine wall (see fig.).

In accordance with the technique I described in the issue of this Journal. Vol. 29, No. 4, 1922, all the tumours were removed through a single incision on the front wall of the uterus, those not directly accessible being reached by secondary incisions opening into the primary incision. The largest of the tumours shown in the photograph, besides many of lesser size, were in the posterior wall, and most of these were reached by incising the posterior uterine wall through the cavity of the uterus. Every fibroid that could be felt having been removed, the uterus was reconstructed in the manner described in my article already referred to. Convalescence was quite satisfactory until the third week, when the patient was suddenly seized with fever and severe pain in the right loin and became exceedingly ill. In my absence, Mr. Arthur Gray very kindly saw her and reopened the abdomen just above the original wound. He found a collection of fæcal smelling pus in the right loin outside the colon, not descending into the pelvis or connected with the uterus which appeared satisfactory. He judged the abscess to be connected with the appendix, but the patient was too ill for him to do more than freely drain the abscess through an incision in the right loin. The operation immediately relieved the symptoms and thereafter convalescence was uninterrupted.

There are several points about this case which make it worth recording. Such a large number of fibroids in one so young is most



Photograph of the fifty-two fibroids enucleated. The largest was the size of a Jaffa orange.

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remarkable. I have now seen a good many cases of fibroids in women under 25 years of age, and in the large majority of them the tumour, though perhaps large, was solitary. In this case most of the fibroids had undergone hyaline degeneration and the uterine tissue surrounding them was exceedingly vascular.

The enucleation of so many tumours would have been impossible but for the hæmostasis effected by the myomectomy clamp described by me in the issue of this Journal, Vol. 30, No. 3, 1923. With this instrument controlling both uterine arteries and a ring forceps on either ovario-pelvic ligament, the operation was almost bloodless. *I have found that the uterine arteries are best secured if the blades of the clamp are made to include the round ligaments.* If these structures are left outside the grip of the clamp there is a likelihood of the uterus being compressed below the level where the uterine arteries enter it, in which case the instrument fails to effect hæmostasis.

In my previous paper I stated that there seemed no reason why 50 or more tumours should not be enucleated given suitable conditions, and this case proves it. As far as I know, no such number of fibroids has ever been removed in this way before.

NOTE.—Since writing the above I have seen and examined the patient. The uterus feels normal but she has not menstruated since the operation. I have seen similar temporary suppression before.

Adenomyoma of the Recto-vaginal Space with Recurrent Polypi in the Vagina.

By Wm. Fletcher Shaw, M.D., Ch.B. (Victoria, Manchester),
Lecturer in Obstetrics and Gynæcology, Manchester University; Hon. Assist. Gynæcological Surgeon, Manchester Royal Infirmary; Hon. Assist. Surgeon for Women, St. Mary's Hospitals, Manchester.

Mrs. B., 38 years of age, married and with two children, the last eight years of age, consulted me in July 1922, on account of chronic pain in her back and left side, especially during and immediately after menstruation. I found she had a fibroid polypus about the size of a walnut protruding from the cervical canal, and a few days later I excised this in St. Mary's Hospital. On section the polypus was found to contain one large cyst, filled with clear glairy fluid. Unfortunately the specimen was lost and I obtained no report from the laboratory, but in view of the after-history I think this must have been an adenomyoma.

In November (four months later) she again consulted me and I now found a mucous polypus springing from the cervix, about the size of a walnut. I readmitted her to St. Mary's Hospital and excised this mucous polypus and then found there was a small one about the size of a pea springing from a hard base in the posterior fornix of the vagina. This, with the hard base, was also excised and the pathological report showed it to be an adenomyoma.

Two years later, in September, 1924, the patient again consulted me and this time I found the top of the vagina completely filled with a mass of soft mucous polypi, and under an anæsthetic I was able to divide these into three groups: one a mass of about six polypi, springing from the edge of the cervical canal (*a*), while another mass of equal size sprang from the outer edge of the cervix (*b*), and the third from the highest point in the posterior fornix, originating in a hard base (*c*). These polypi were bright red in colour, soft and of considerable size, up to $1\frac{1}{2}$ inches in length, and formed altogether a mass as large as an orange. I decided to perform a panhysterectomy but the difficulty of thoroughly sterilizing the soft mass of polypi was so great that I felt compelled to excise these by the vaginal route before opening the abdomen to complete the hysterectomy, though in doing this I realized I was spoiling the specimen.

Fig. I. Uterus removed by panhysterectomy with an adenomyoma in the cervix showing large mass of polypi springing from the sites A, B and C. Polypi consisted of adenomatous tissue covered by stratified epithelium.

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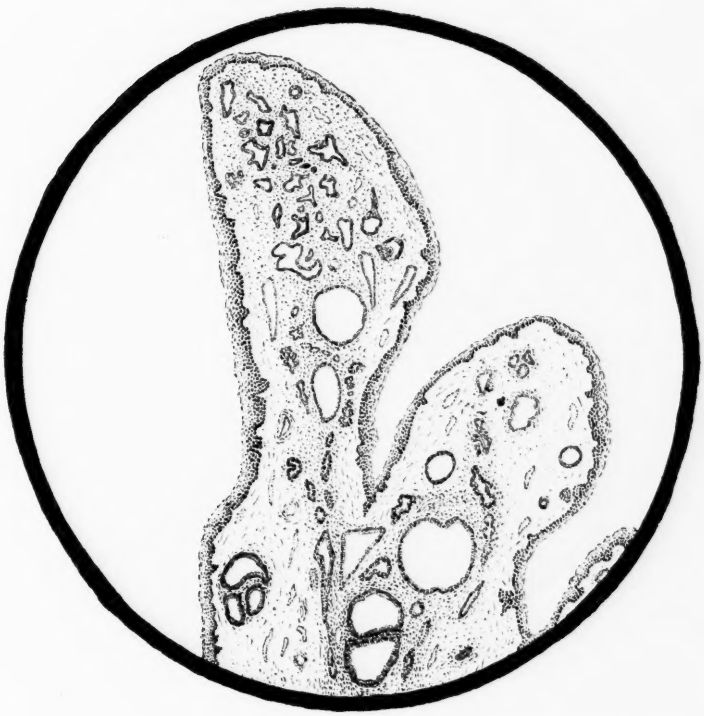

Fig. II. Drawing of tip of one of the polypi. This shows it to consist of adenomatous tissue covered with stratified epithelium.

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I found the panhysterectomy a very difficult operation as the cervix was very much thickened, and on its posterior wall was a lump about the size of a walnut which had burrowed deeply into the rectal wall. This was dissected out and the whole of the uterus and appendages removed. The patient made an uninterrupted recovery and is now quite well and strong.

The specimen consists of a uterus removed by panhysterectomy together with both appendages and with a small portion of the vaginal walls retained all round the cervix. The cervix is much enlarged by a hard mass, the size of a small hen's egg, which protrudes on its posterior surface.

The drawing was made after the uterus was bisected and shows the tumour to have replaced the posterior cervical wall and to protrude into the cervical canal. Sections of this tumour show it to be an adenomyoma with numerous spaces lined by columnar epithelium filled by a clear glairy fluid like cervical secretion and without evidence of blood. The polypi sprang from the sites marked A, B and C, and the drawing has been reconstructed to show them arising from their original sites, although in reality they were removed before the hysterectomy was performed, to facilitate the cleansing of the cervix and vagina.

Sections through B. and C. show adenomatous tissue sprouting downwards and sections of the polypi themselves show these to consist of adenomatous tissue covered by stratified epithelium, so they would seem to have been produced by overgrowth of the adenoma into the vagina and to have acquired a thin covering of the stratified epithelium of the vagina and vaginal portion of the cervix.

When I first operated upon this patient in 1922 I removed a polypus with a cyst containing thick glairy fluid which I now think must have been an adenomyoma, but there was no appreciable thickening of the cervix itself.

At the time of the second operation, four months later, the adenomyoma had developed sufficiently to invade the posterior vaginal fornix and again showed its special characteristic of polypus formation by producing a second one from the cervix itself and a small one in the posterior fornix.

At the third operation, two years later, the adenomyoma had grown to a considerable size and showed this characteristic of polypus formation to a very marked degree.

The literature on adenomyoma is scattered so widely through the various medical journals that it is difficult to review it thoroughly, but so far as I have been able to do so I have not found any case quite like this one. The nearest to it is one reported by Herbert Spencer in the *Journal of Obstetrics and Gynæcology of the*

British Empire, Spring, 1923, page 44, in which he found a soft, friable mass springing from the left vaginal fornix by a fairly broad base and which proved, on microscopical examination, to be an adenomyoma. In this case there was also a small mucous polypus springing from the cervix itself. This uterus was not removed and the patient is reported to be free from recurrence two years later, but it will be interesting to see if any further growth does occur in the future though it is less likely to do so at her age, 54 years, than in my patient, who was in the full vigour of sexual life.

An adenomyoma of the recto-vaginal space very commonly invades the vaginal mucosa in the posterior fornix producing a puckered hard mass which is liable to be mistaken for an epithelioma. Lockyer mentions and illustrates several of these, and the first adenomyoma I saw in this situation was mistaken by me for a malignant growth and operated upon under this impression, but in none of the cases I have seen reported have the polypi been of anything like the size of those found in this case.

For one of the drawings and for the notes of the case I have to thank Dr. Hunter, Resident Surgical Officer at St. Mary's Hospital.

Adenomyoma of the Round Ligament, which Menstruated through an Inguinal Incision.

By

Wm. Fletcher Shaw, M.D., B.Ch. (Victoria, Manchester),

Lecturer in Obstetrics and Gynæcology, Manchester University; Hon. Assist. Gynæcological Surgeon, Manchester Royal Infirmary; Hon. Assist. Surgeon for Women, St. Mary's Hospitals, Manchester.

I first saw Mrs. R. in 1914. She had one child in 1913 and was brought to me because of irregular, scanty menstruation with severe dysmenorrhœa and chronic pain in the right side.

I performed a laparotomy in August, 1914, and found a double uterus, but I can obtain no further information about this operation as the commencement of the war threw everything into a turmoil and the notes of the case are very deficient.

After this operation the periods were regular but still scanty, and the dysmenorrhœa and chronic pain in the right side were not altered.

Six years later, 1920, the patient had another child, but her symptoms remained the same, and in 1924, 10 years after her first visit to me, she again consulted me with the same symptoms and a swelling in the region of the right groin.

I found she had an anteflexed uterus, enlarged, tender right tube and ovary, apparently adherent to the uterus, and a soft fluctuant swelling in the right groin about the size of a golf ball, which I took to be a broken-down inguinal gland.

After her admission into the Infirmary I incised this swelling, and was surprised to find it contained, not pus, but a black tarry fluid. The wound healed except for a small space in the centre which remained open, and four months later the patient again consulted me because the original symptoms—dysmenorrhœa and chronic pain in the right side—had not improved, and in addition, this sinus had not healed, and every time she menstruated there was a discharge of blood from it.

I took her again into the Infirmary and opened her abdomen. I found she had a double uterus with a very short, thick, round ligament on the right side which ended in a mass about the size of a golf ball, deep in the right abdominal wall in the position of the

internal inguinal ring. I removed the uterus and both appendages but did not remove the lump in the abdominal wall, as it would have meant very deep dissection with much damage to the muscular tissue; moreover, if it was an adenomyoma, as I now concluded it was, it would gradually atrophy and cease to function after removal of the ovaries.

Dr. Bailey kindly examined the specimen for me. The right ovary is an adenomyoma but apparently has passed its active phase as the epithelial cells are of a low columnar type and their nuclei in many cases show signs of degenerative change. He could find no trace of adenomyoma in the round ligament, but this was only to be expected as I had cut this ligament internal to the mass in the abdominal wall. I consider the swelling to be an adenomyoma arising from the outer part of the round ligament which, as it grew and became distended with blood, tended to burrow into the abdominal wall rather than along the round ligament, and finally produced this fluctuant swelling under the skin in the inguinal region, which I mistook for a suppurating inguinal gland.

The patient made an uneventful recovery, the inguinal incision closed and the pain disappeared, due in all probability to the adenomyoma in the abdominal wall ceasing to function when both ovaries were removed. When I examined the patient six months after the operation there was no thickening to be detected in her abdominal wall.

Lockyer states that this type of adenomyoma is liable to be mistaken for a hydrocele of the Canal of Nuck, but mentions one case recorded by Mary Scharlieb which was mistaken for a suppurating inguinal gland. I can find no record of an adenomyoma of the round ligament continuing to menstruate through the incision as mine did.

A Case of Eclampsia treated by my improved Prophylactic Method.

Professor STROGANOFF (Leningrad).

ON the basis of 253 cases of eclampsia treated by my improved prophylactic method, and 570 cases treated by my older prophylactic method reported to the Section of Obstetrics and Gynæcology of the Royal Society of Medicine, on the 3rd of July, 1924, I pointed out the possibility of obtaining the following results in patients who had not been neglected :—

(1) Recovery of mothers from eclampsia—100 per cent.

(2) Very great probability that the fits will cease immediately treatment is commenced (90 per cent. approximately) provided my method is closely adhered to.

From the paper it was also clear that in cases of eclampsia sub-graviditate, there is an appreciable possibility that on the cessation of the fits pregnancy will resume its normal course and the child will live to term if the mother does not contract nephritis, sepsis, inflammation of the lungs, or some other complication.

The following are particulars of the one case I was able to treat at Queen Charlotte's Maternity Hospital in London, under the care of Mr. Aleck Bourne. They show the extent to which the above mentioned claims are justified, and give an analysis of the course of the treatment in this particular case.

The patient, who was admitted to the hospital on July 26th, 1924, at 11-30 a.m. after one fit in her own home, had a second fit immediately on her arrival at the hospital. She was 26 years old, and her first pregnancy ended in miscarriage during the seventh month, the cause of which was unknown. The fœtus was macerated. The patient was of a comparatively strong constitution. Her pulse-rate was approximately 85, breathing was clear, and œdema was found in the legs and face.

The doctor sending in the patient notified that she had a severe headache, and was suffering from vomiting and anasarca.

The height of the uterus indicated the eighth month of pregnancy. On admission, it was found that her urine was acid, was almost solid with albumin, and contained granular casts. The patient was nearly comatose, she was not in labour and there was no hæmorrhage. The child was alive. Thus we had a case of eclampsia in a bad subject in the eighth month of pregnancy, and

in one who had already had a miscarriage during the seventh month with a macerated fœtus. Fortunately, the patient arrived for treatment in an early stage of eclampsia. It is very important to estimate the degree of severity of the eclampsia in this case.

The following facts caused me to regard the case as severe :—

(1) The eclampsia appeared at the eighth month of pregnancy and labour had not supervened.
(2) It was a second pregnancy.
(3) The patient had nephritis.
(4) After the second fit, consciousness very slowly returned, and even after two and a half hours was not complete.
(5) Blood pressure was relatively low.

The majority of authors agree with me with regard to the first four points. With reference to the fifth point, this question is not as yet finally agreed upon. I consider that both low (less than 140 mm.) and extremely high (greater than 200 mm.) blood pressure indicates severe eclampsia. Eden came to this conclusion from observations in England.

The patient was immediately given chloroform (two drachms), for a period of ten minutes, after which the blood pressure was (11-35 a.m.)—138 syst.—90 mm. of mercury diast.

As soon as the hypodermic injection could be prepared (11-45 a.m.), a third of a grain of morphia was given while the patient was under chloroform. Such a large dose, in comparison with that usually employed (gr. $\frac{1}{4}$), was administered partly because of the relative severity of this case and the strong constitution of the patient, but mainly on account of the impossibility of eliminating the noise of street traffic.

The case proceeded as follows :—

11-55 a.m., blood pressure unchanged, pulse rate, 70; temperature, 98.6.

12-0 a.m., $4\frac{1}{2}$ ozs. urine removed by catheter, under chloroform $2\frac{1}{2}$ drachms. Analysis of urine : acid, sp. gr. 1,024; solid albumin; no sugar; very many casts (granular); epithelial cells present; leucin and tyrosin absent.

12-15 p.m., chloroform, 45 minims.

12-25 p.m., *per rectum:* chloral hydrate, gr. 30; milk, 2 ozs.; normal saline, $3\frac{1}{4}$ ozs.; under chloroform 20 m. (5 drachms total). Part of this was returned *per anum* in 15 minutes. Therefore at :

1-25 p.m., *per rectum:* chloral hydrate, gr. 15; Milk, 1 oz.; normal saline, 13 drachms; under chloroform 20 m.

2-25 p.m., Morphia $\frac{1}{4}$ gr. subcutaneously; chloroform 30 m.—

2-30 p.m., the patient's consciousness improved and she said "I feel very well better than all last week."

4-25 p.m., *per rectum* under chloroform 45 m.; chloral hydrate, gr. 15; milk, 1 oz.; normal saline, 1½ ozs.

6-25 p.m., Rectal injection repeated without chloroform. Blood pressure, 154; temperature, 98.4; pulse-rate, 70; sleeping.

9-30 p.m., Blood pressure: syst., 148; diast., 90 mm.

9-45 p.m., *per rectum* under chloroform (40 m.), chloral hydrate, gr. 15; milk, 1 oz.; normal saline, 1½ ozs. Urine passed voluntarily, 6 ozs. Patient moved, under chloroform, to another ward. Chloroform: total, 7 drachms.

Total during first day: chloroform, 7 drachms; chloral hydrate, 1½ drachms, and morphia, 7/12 gr.; urine, 16½ ozs.

July 27th, 1924, second day.

2-0 a.m., sleeping. 2-40 p.m., chloral hydrate, gr. 15 in milk by mouth.

5-35 a.m., rectal injection—chloral hydrate as above, without chloroform. Patient quite quiet and drowsy. Urine passed, 6 ozs.; temperature, 98.6; pulse-rate, 70; respiration, 16.

10-45 a.m., blood pressure, 140 mm.; temperature, 98; pulse-rate, 60; respiration, 20; sleeping.

3-30 p.m., rectal washout—retained. Urine passed, 12 ozs.

4-0 p.m., tea given.

4-30 p.m., sleeping.

8-0 p.m., patient's position is being changed from right to left every 3–4 hours. Blood pressure, 162 m.m.; temperature, 97.8; pulse-rate, 52.

10-10 p.m., headache. Chloral hydrate, gr. 23 by mouth. Amount of albumin by Esbach, 3.5 per thousand; cascara, 2 drachms; blood pressure, 148 mm.

July 28th, 1924, 8-0 a.m., complaining of headache. Chloral hydrate, gr. 23. Blood pressure, 148 mm.

9-0 a.m., headache better. Blood pressure, 144 mm.

July 29th, 1924, 11-0 a.m., bowels open-rather constipated. Urine, 6 ozs.

1-0 a.m., chloral hydrate, gr. 23 with milk.

2-40 p.m., bowels open—watery stool. Blood pressure, 138 mm.; temperature, 98; pulse-rate, 70.

8-0 p.m., urine, 6 ozs.

10-0 p.m., chloral hydrate, gr. 15 with milk; cascara, 2 drachms.

11-0 p.m., patient vomited.

11-40 p.m., bowels open—watery stool. Esbach, 2.5 per thousand.

July 30th, 1924, 6-45 a.m. chloral hydrate, gr. 15; cascara, 2 drachms. Urine, 25 ozs.

During the fourth day the patient complained of headache and was given gr. 23 of chloral hydrate and gr. 19 of veronal. Urine 53 ozs., and certain quantity lost with two stools. The heart-beat of the fœtus was all the time good. Further gradual improvement of the headache and of condition of urine. The casts disappeared in the second week, and the albumin remained till the end of the third week. It seemed that the uterus with a living fœtus was larger than the term of pregnancy would suggest.

After August 2nd, the patient was allowed to eat milk pudding, potatoes, fruits, bread and butter.

As will be seen from the above, all my claims were justified in this case.

Obviously, a single case shows comparatively little, but almost identical results were obtained by me in the clinics of Prof. Rosthorn in Heidelberg,* of Profs. Schauta and Piscacek in Vienna,* and of Profs. Bumm and Franz in Berlin† and in Petersburg.

I am very sorry that I was not able to visit the Glasgow Royal Maternity and Women's Hospital, where for every 28 labours occurs one case of eclampsia and in individual months the figure has been known to reach one case of eclampsia to each 11 labours (Dec., 1914), and where from 814 cases during ten years, 183 mothers died (= 22.4 per cent.), and about 60 per cent. of the children also died.‡

In conclusion, I express my deepest thanks to the members of the Obstetrical and Gynaecological Section of the Royal Society of Medicine, and especially to Comyns Berkeley and Aleck Bourne, for the many kindnesses shown to me by them and for their sympathetic consideration of this experiment.

* *Zentralblatt f. Gynäkol.*, 1910, n. 23.

† *Zentralblatt f. Gynäkol.*, 1912, n. 25, and *Ann. de Gynécol. et d'Obstet.*, July, 1912.

‡ John Norman Cruickshank, *Journ. of Obstet. and Gynæcol. of Brit. Emp.*, No. 4, Winter, 1923.

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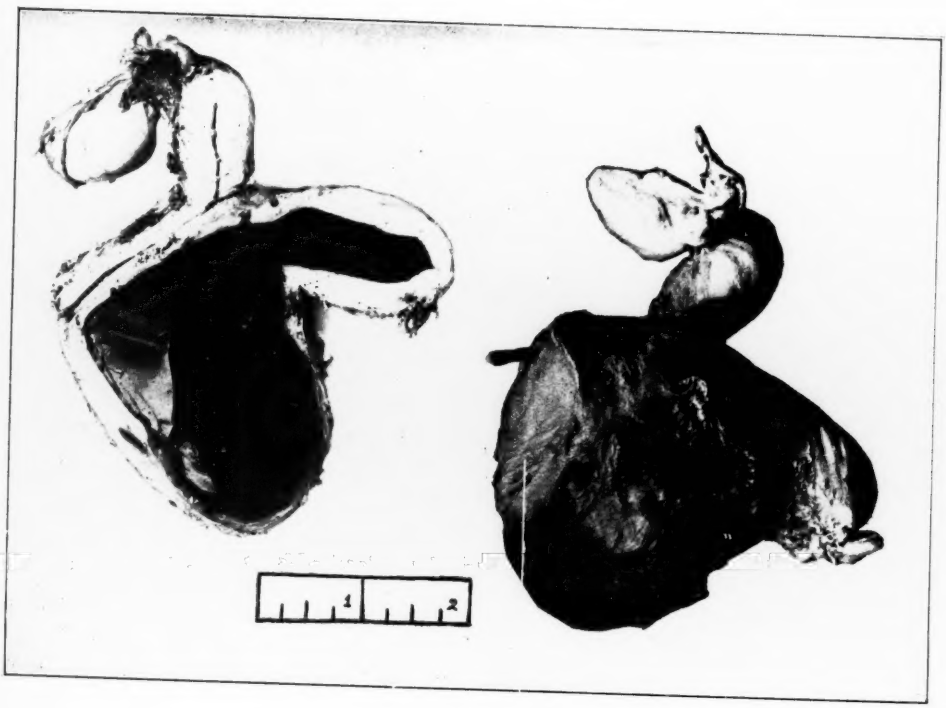
Probe in small cervix.



Vaginal mucosa.

A Case of Double Uterus and Vagina with Unilateral Hæmatocolpos and Hæmatometra.

By

J. St. George Wilson, *M.C.*, M.B., Ch.M. (Liv.), F.R.C.S. (Eng.),
Honorary Surgeon, Samaritan Hospital for Women, Liverpool.
(From the Department of Gynæcology and Obstetrics, the University of Liverpool.)

History of the case. A. H., a single girl, æt. 14 years, had menstruated four times, every four weeks and for four days, the last menstruation ceasing a few days before admission to hospital. The loss had been copious and there was severe intramenstrual pain.

The patient complained of " pain in the seat," which had been present for two months, and was usually worse at night.

On examination under anæsthesia, the cervix was found to form a slight elevation on a swelling which bulged into the vagina from the left side of the pelvis. The tumour was of the same size as that of a goose's egg, and felt solid. The body of the uterus could not be distinguished apart from the swelling, and the whole mass was slightly mobile from side to side, and could not be pulled down towards the vaginal orifice. An attempt to pass a sound into the cervix failed. A diagnosis of sarcoma of the uterus was made.

Operation. When the abdomen was opened it was noticed that the peritoneal surfaces of the pelvic organs were stained with a slight film of brownish material. The uterus and both appendages were removed together with the swelling which was deeply embedded in the floor of the pelvis.

The specimen consists of a regular cystic swelling 3 inches by $2\frac{1}{2}$ inches by 2 inches. It is flattened on its right side on which is situated the button-like cervix with an oval piece of vaginal mucosa. From the upper part of the tumour spring two uterine bodies : these are quite separate. The one on the left side is the larger, measuring 2 inches by $1\frac{1}{2}$ inches by 1 inch. The smaller one measures $1\frac{1}{2}$ inches by $\frac{3}{4}$ inch by $\frac{3}{4}$ inch and is situated behind and to the right. To the summit of each is attached a normal Fallopian tube, and on the right side a normal ovary.

On hemisection, the wall of the cystic swelling is seen. This varies from one-tenth of an inch to three-tenths of an inch in thickness and encloses material typical of that associated with hæmatocolpos. The cavity of the larger uterus situated above the swelling is also seen to be distended with brown material similar to, and continuous with, that contained in the distended vagina.

The elongated cervical canal of the right uterine body is to be seen running along the wall of the cyst, for a distance of $1\frac{3}{4}$ inches, where it terminates in the small cervix on the vaginal surface.

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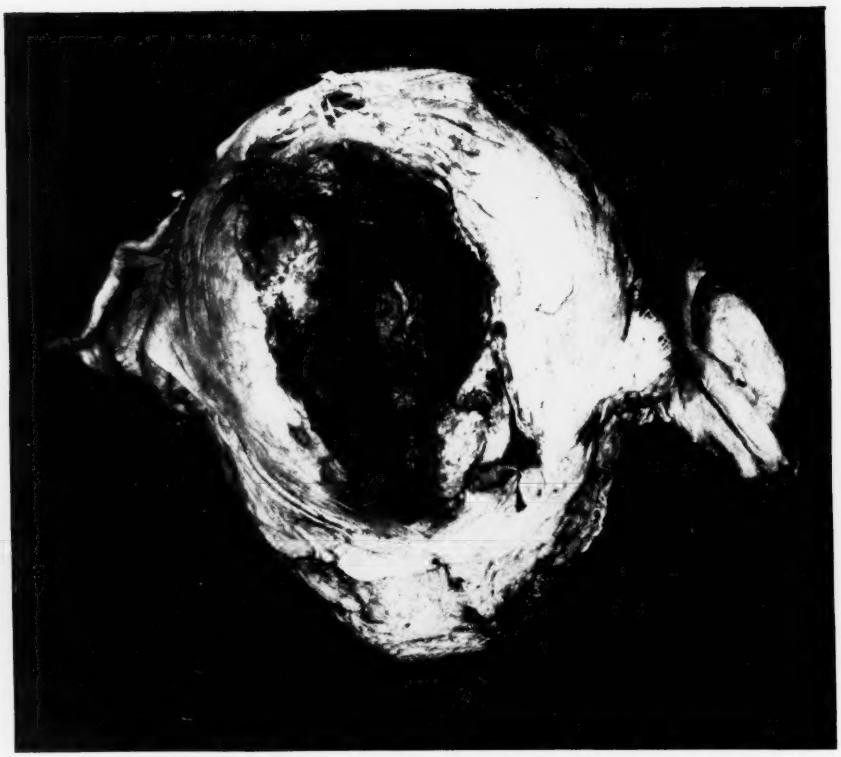


Case I. The lower two-thirds of the previous Cæsarean section scar has given way. The upper one-third of the scar can be clearly seen and also the unabsorbed catgut sutures running transversely across it.

Notes on Two Cases of Ante-Partum Rupture of the Uterus through a Previous Cæsarean Section Scar.

By K. Vernon Bailey, *M.C.*, M.D., Ch.B. (Manchester),
Resident Obstetric Surgeon, St. Mary's Hospital, Manchester.

Case 1. Mrs. S., aged 42 years; a ix-para. Admitted to St. Mary's Hospital on May 12th, 1924.

Obstetric History. Seven full-time, normal labours; one previous Cæsarean section performed for ante-partum hæmorrhage. This was in December, 1922.

The patient stated that labour started 18 hours immediately preceding admission to the hospital.

On admission she complained of a diffuse abdominal pain—"not like labour pains." She looked ill. The breathing was laboured and her colour poor. The temperature was 97.8° C., and pulse-rate 120. There was no bleeding *per vaginam*. She was able, however, to give a lucid account of her history and symptoms and at first sight did not appear to be suffering from such a severe condition as transpired. The symptoms of a concealed or internal hæmorrhage were nevertheless quite definite.

On examination the abdomen was seen to be irregular in outline and was somewhat tender on palpation. The child was lying obliquely with its head in the right umbilical region. Its limbs were so easily palpable that it was suspected that they were lying just beneath the abdominal wall. Free fluid could be detected in the abdominal cavity.

Per vaginam it was not possible to pass a finger through the cervical canal into the uterine cavity—the internal os being closed. No presenting part could be felt but the body of the uterus could be palpated through the posterior vaginal fornix.

A diagnosis of rupture of the uterus was made.

Operation. The abdominal cavity contained a quantity of free blood. A 9½ pounds child, together with its umbilical cord and the placenta, lay free in the abdominal cavity—having been extruded through the tear in the uterine wall which measured 4-5 inches in length. A small portion of the membranes was still adherent to the uterine cavity. The child was dead.

This complete expulsion of both child and placenta had enabled the uterus to contract sufficiently to arrest serious hæmorrhage.

Only a slight oozing was observed from the raw surfaces at the site of rupture. The uterus itself had contracted to the normal size of a full-time uterus after parturition and a wide but thin scar could be seen running mesially down its anterior surface. This scar had given way in the lower two-thirds.

Supra-vaginal hysterectomy with removal of the appendages was performed. The patient made an uneventful recovery.

According to the period of amenorrhœa labour was due. Presumably the rupture had taken place before the onset of labour as the cervix was not drawn up and there was no dilatation of the internal os.

It would appear, therefore, that in this case the previous Cæsarean section scar had given way owing to the gradual distension of the uterus by the growth of its contents and not as the result of failure on the part of the cicatrix to withstand the muscular contractions of labour.

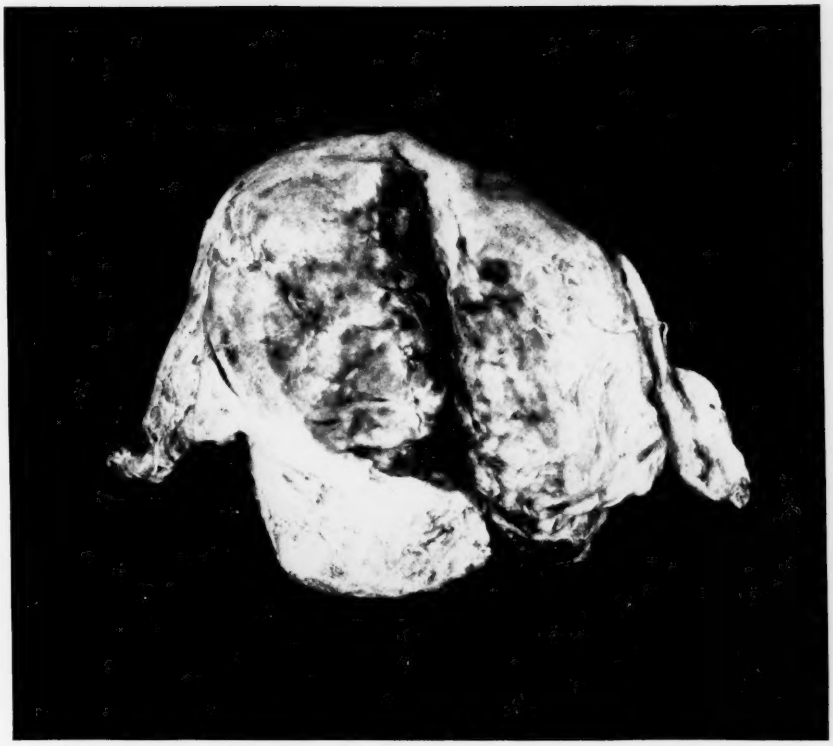
An interesting point in connexion with the specimen is the fact that the catgut sutures used at the previous operation have apparently withstood absorption. They could be easily seen and dissected out. This operation was performed 18 months before and 40 day catgut was used (not at St. Mary's Hospital). It is possible that the weak scar was due to a devitalized state of the uterine muscle owing to hæmorrhage into it.

Case II. Mrs. M., aged 29 years; iv-para. Admitted to St. Mary's Hospital on November 20th, 1924.

Obstetric History. Three Cæsarean sections for contracted pelvis. The last operation was 21 months ago.

This patient had been seized with vague abdominal pain of a diffused nature three hours before admission. She was to have been admitted for Cæsarian Section and sterilization on December 22nd, but the onset of this pain caused her to report to the hospital at once. On admission the abdominal pain had largely subsided and the patient expressed herself as "much better." The temperature was normal and the pulse regular and of good volume and tension. The patient's facial expression was somewhat strained. The breathing was normal and regular.

On examination the abdomen was seen to be full, but soft and pliable. The contour of the uterine tumour could not be seen, but what appeared to be a ventral hernia occupied the umbilical region. This protrusion was of the consistence of intestine but was dull to percussion. The fœtal parts could be indefinitely palpated in the right and left umbilical regions. There was slight but definite tenderness on palpation of the abdomen. The flanks were resonant to percussion and there was no evidence of free fluid in



Case II. A mesial longitudinal rupture of the anterior uterine wall involving the whole of the previous Cæsarean section scar.

the peritoneal cavity. *Per vaginam* there was a thin but constant trickle of blood. There was no dilatation of the internal os. No presenting part could be felt.

At operation the intact membranes were observed to have herniated through a mesial longitudinal rupture of the anterior uterine wall. It was these membranes—filled with liquor amnii—that had produced the appearance of a ventral hernia on inspection of the abdomen.

The child was removed but failed to survive. Its weight was $5\frac{1}{2}$ pounds. The placenta was partially separated and the uterus itself had contracted. There was a little free blood in the peritoneal cavity. Supravaginal hysterectomy with removal of the appendages was performed.

In this case the whole of the previous Cæsarian section scar had given way—presumably owing to the gradual uterine distension. This had occurred at the end of the eighth month of pregnancy.

In this case, as in the first, the condition was accompanied by astonishingly few symptoms. There was no shock and very little hæmorrhage in either case—a condition of affairs which might conceivably lead to a mistaken diagnosis. It is the deceptive nature of this type of case from a clinical point of view that I chiefly desire to emphasize.

I would also mention that this second case is the only one of its kind which has occurred in St. Mary's Hospital during the last 18 months, where an average of 120 Cæsarean sections are performed yearly.

Prior to 1922, the most recent case in this hospital is that reported by Fletcher Shaw[1] in 1914 and mentioned in Eardley Holland's[2] paper of 1920.

Cases of rupture of the uterus through a previous Cæsarean section scar have been reported by many writers in recent years. Munro Kerr[3] reports two such cases out of 110 operated upon in his department during 12 years and says that "should it be impossible to secure an absolutely sound cicatrix, then classical conservative Cæsarean section will have to be abandoned." As an alternative he suggests operating upon the lower uterine segment.

REFERENCE.

1. Fletcher Shaw. *Journ. Obst. and Gynæcol. of Brit. Emp.*, Oct.–Dec., 1914, xxvi.
2. Eardley Holland. *Trans. Roy. Soc. Med.*, 1920.
3. Munro Kerr. "Operative Midwiery," 1916.

A New Volsellum Forceps. A New Tissue Forceps.

By Louis Carnac Rivett, M.B., M.C. (Cantab.), F.R.C.S. (Eng.).
Assistant Surgeon, Chelsea Hospital for Women; Gynæcologist, Queen Mary's Hospital; Physician to In-patients, Queen Charlotte's Hospital.

The inadequacy of volsellum forceps for holding the cervix uteri, and of tissue forceps in the operation of colporrhaphy and perinæorrhaphy is widely recognized, and I have attempted to design an improved pattern of each.

The ideal volsellum forceps must be capable of applying considerable traction, and at the same time must not lacerate the tissues, and in myomectomy operations it is sometimes advantageous to use a twisting action.

This volsellum forceps has withstood severe tests in these three particulars.

The tenaculum portion is composed of three interlocking pyramids arranged as shown in the diagram. The whole forceps is stronger than is usual and particular attention has been paid to the width of bearing surface of the joint. The handles are shown with only a very slight curve, but there is no reason why this should not be increased.

The tissue forceps gives a good grip without tearing; the broad joint overcomes any tendency to overlapping—a common fault in "Kocher's" forceps.

Both instruments have been made for me by Messrs. Allen and Hanbury's, London.

UNIV. OF MICH.

Obituary.

HERBERT WILLIAMSON, M.A., M.B., F.R.C.P.,
Physician Accoucheur to St. Bartholomew's Hospital.

By the sad and unexpected death of Dr. Herbert Williamson on December 15th 1924, in his 53rd year, not only St. Bartholomew's Hospital, but also the Medical Profession share together in an irreparable loss.

He was educated at the Leys School and then proceeded to St. John's College, Cambridge, where he took his degree in Natural Science. To those who knew him at Cambridge, the power of brilliant and amusing speaking, for which later he was justly noted, was no new thing. Even in his student days his striking talent in this respect was already evident, and even at that time marked him out as one quite out of the common. While at College, one of his greatest interests apart from his work was the study of English literature, which at that time had a great fascination for him.

He left Cambridge in 1893 and came to London in order to complete his medical studies. As was characteristic of him, he personally visited and inspected several hospitals before he made his final choice but, as he was fond of relating, when he looked through King Henry the Eighth's Gate and saw the fountain, the trees and the flowers he felt his search was at an end. From that time he was gripped by the spell of this ancient institution, and in it he always held an honoured place.

He had a brilliant student career. Teachers and fellow students alike recognised his exceptional powers. None had any doubt that he was marked out for success in whatever walk of the profession or of life he chose to undertake. He obtained the Brackenbury Scholarship in Surgery in 1896, and was House-Surgeon to Sir H. Butlin and Mr. Lockwood before he became Intern in the Obstetric and Gynæcological Department. He obtained the M.R.C.S., L.R.C.P. diplomas in 1896, and the degrees of M.A., M.B., B.Ch. in 1898. He was elected F.R.C.P. in 1911. After he qualified he was somewhat undecided as to his future career and went out to the South African War, during which he served for a time as a Surgeon in the Imperial Yeomanry Hospital. After this he returned to St. Bartholomew's in order to take up the appointment of Midwifery

Tutor, in which capacity he served the school and the Hospital for several years with marked success. The Tutorship in those days was an onerous post, for it combined the duties of Pathologist and Registrar to the Department with the holding of instructional classes. The characteristics of his work then as always were the extraordinary energy with which he hurled himself into his work, the lucidity and power of his teaching, and the enthusiasm which he inspired. Even then his classes were crowded and he proved himself one of the best teachers the School has ever produced. Sir Francis Champneys and Dr. W. S. A. Griffith, who were at that time respectively Physician Accoucheur and Assistant Physician Accoucheur, were quick to recognize his merits and in 1907 he was appointed Assistant Physician Accoucheur, the post being specially created for him by increasing the *personnel* of the Department. Thus he became Assistant Physician Accoucheur without being obliged to wait for a vacancy, which did not in fact occur for a good many years. In 1913 he succeeded to the post of Physician Accoucheur with charge of Outpatients, and in 1919 became Physician Accoucheur. In the wards the brilliant promise of his earlier years was fulfilled, and he worthily maintained the great traditions built up by former holders of that post. His lectures and ward rounds were always well attended, indeed it was often difficult to find space to accommodate the large numbers he attracted. It has been well said of him that " He became an institution. As a teacher he was in the front rank; as a gynæcologist his talents were widely recognized; and as a wise admirer and sure friend of the student and general practitioner he was known to an extensive and steadily increasing circle."

He was at one time a member of the Staff at the Royal Waterloo Hospital for Children and Women, and was Inpatient Physician at the City of London Maternity Hospital until, owing to his increased duties consequent upon the enlargement of the Obstetric Department at St. Bartholomew's, he was obliged to relinquish these posts. Not only did these duties take up more of his time, but much of the organising and planning were due to his foresight and sagacity.

He was an examiner in Obstetrics and Gynæcology for the Conjoint Board and for Cambridge University.

Not only, however, was he of such great value in his own Department, but some of his best work was done in the various committees of the Hospital and College and in the Medical Council, of which he was Chairman. In these his quick grasp of the essential point, his farsightedness and eloquence rapidly brought him into such a position that all came to rely upon his judgment and all sought his advice. Problems which seemed difficult or complicated

of solution would appear, after a few words from him accompanied by a flash from his striking eyes, to be simple, and a path out of the difficulty would emerge.

Apart from his own hospital sphere, he took a vigorous and no less active share in the meetings of the Section of Obstetrics and Gynæcology of which he was Vice-President, and also a member of the Committee appointed to investigate the etiology, prognosis and treatment of Eclampsia. He made many important communications before the Section and was the author of numerous papers, most of which appeared in this Journal. He was the author of the chapters upon the Diseases of the Ovary both in Allbutt and Playfair's, and also in Eden's system of Gynæcology. His writings show that although he took so wide an interest in any matter pertaining to obstetrics and gynæcology, his chief work was centred upon diseases of the ovary, the toxæmias of pregnancy and diseases of the kidney in pregnancy, upon which subjects he came to be regarded as a leading authority. At the time of his death he was a member of the Committee appointed to organize the Fifth British Congress in Obstetrics and Gynæcology to be held this year in London. In this he would have taken a leading part and his loss leaves a gap which no one can quite replace.

Since the war he became known to an ever increasing circle, not only as a great teacher, but as a public speaker. His eloquence, wit and humour marked him as one of the orators of the profession and as one upon whom the mantle of Norman Moore had descended.

Those of us who were privileged to hear him when he spoke at the octocentenary dinner of St. Bartholomew's Hospital in 1923 and at the dinner of the Royal Society of Medicine last year, were filled with delight at his exceptional power and with pride in him. Those speeches gained for him a reputation which, in the estimate of those most competent to judge, placed him in the front rank and made his name familiar to many who had not previously known him.

Apart from his work, he had few interests; it absorbed him and he really enjoyed it. To his friends he never appeared so happy as when he was engaged in the investigation of some difficult case or in writing a paper upon some medical subject in which he was engaged. Indeed he did not spare himself sufficient time for healthful relaxation, he was always at work. Even his Sundays were taken up by the calls of his profession and the week-end habit was a thing unknown to him, for as was only to be expected of a man of such exceptional power, he attracted to himself a large private practice. His patients loved him. He was the last man to spare himself or to think of himself when his hospital or his patients called for his help, but always gave them unselfishly of his best.

Either he was not interested in sport or the many calls upon his time made it impossible for him to take his share in it. He did not golf, or shoot, or fish, but he was fond of walking exercise. Of late years he had always taken his holiday in Cornwall where he was accustomed to go for long walks.

As a companion he was always cheerful and inspiring, he could tell a good story well, and his conversation always held some bright sparkle of wit and humour.

His sudden end at the height of his powers cuts short a brilliant career. Already he had done so much that much was expected of him, and none can tell to what limits he might have reached.

He is gone, but his example lives.

—J.B.

BOOK REVIEWS.

"The Principles and Practice of Obstetrics." By JOSEPH B. DE LEE, A.M., M.D., Professor of Obstetrics at the North-western University Medical School, Chicago. Fourth Edition, thoroughly revised. Large octavo of 1,123 pages, with 1,128 illustrations, 201 of them in colours. Price, cloth, 55/-. W. B. Saunders Company, Ltd., London and Philadelphia.

THE merest glance at this prodigious work and the reading of its introductory pages are enough to start reflections on the contrast in outlook between the books on matters obstetric originating from the opposite shores of the Atlantic. A generation or more ago there was no striking difference between the books produced in the two countries—Parvin and Lusk were much as Playfair and Galabin—but the modern developments in midwifery seem to have had a greater effect in expanding the size of the transatlantic than the cisatlantic books and has resulted in a succession of volumes of increasing ponderosity. Author follows author and edition follows edition and we are left marvelling, first, at the industry to produce them and, secondly, at the capacity to absorb them. The change began with the much-appreciated work of Whitridge Williams—now past its coming-of-age—and was accentuated by those of Hirst, Edgar and De Lee, the last-mentioned being the weightiest compilation on obstetrics that has as yet come over from the U.S.A.,—the country of so many of the biggest things on earth of their kind. If the present rate of increase continues, we dread to calculate the size and weight of similar volumes of twenty years ahead.

The absorption of this output is even more remarkable than its production. This is the fourth edition within little more than ten years of the book under notice, and each edition seems to have been reprinted several times, whilst its immediate predecessor (Edgar) took only about half that time to reach its fourth edition and twenty-second thousand. Is there another country in this world from which massive compilations by a single author could be turned out as frequently, and in which a body of medical practitioners could be found with appetites voracious enough to swallow (let us hope also with digestive powers to assimilate) these gargantuan feasts?

It must be left to those with an intimate knowledge of the professions in the two countries and of the conditions under which they practice, to speculate on these divergences in the production and consumption of obstetric treatises (and doubtless other medical publications), but our impression is that they must be regarded by the American doctor as an essential part of the furnishings of his office.

There are so few English words among our medical terms that it is sad to notice that "Midwifery," the roots of which go deep down into the beginnings of our language, appears to be falling into disuse among our American colleagues, who one and all profess "Obstetrics," and, since the day of Lusk, have labelled their books with the Latin-derived term. It

may be but another symptom of the same disease that converts the " lifts " in U.S.A. into " elevators," but internal evidence in the book under review suggests that " midwifery " is acquiring a different connotation over there as a form of practice lowlier than and inferior to that of " obstetrics."

In Prof. De Lee's " Principles and Practice of Obstetrics " there is little or no material divergence in its " Practice " from the accepted teaching on this side. With his methods of treatment in abnormal presentations, pelvic deformity and the hæmorrhages of pregnancy and labour and his management of obstetrical complications we are generally in cordial agreement. His warnings against interference in septic abortion and puerperal sepsis are specially to be commended.

It is in its " Principles " that the difference in attitude towards the reproductive function in the two countries appears, for the doctrine that childbearing must no longer be looked upon as a natural function has found its chief advocates in America, with Professor De Lee as its high-priest. His introduction is largely devoted to this point and is, therefore, worth detailed consideration. So far as we can gather his mental processes seem to have followed these lines. What he terms " the present notorious disappreciation and disesteem of obstetrics " appear to be much on his mind and his idea is that they are due to " the prevalence of the notion that childbirth is a normal function," and that they will continue until " the pathologic dignity of the childbearing function is recognized." Once this higher status in the hierarchy of medicine is attained, obstetrics will be placed on a more elevated plane, its practice more valued and better remunerated by the public and more respected as a specialty by physicians. In support, Professor De Lee brings forward the mortality and disability from childbearing, instances from biology of the sacrifice of the individual in the act of reproduction and quotations—mostly from compatriots—expressing similar sentiments to his own.

His reasoning would serve almost as well to make coitus pathological, owing to the incidence of venereal infections and the analogy of certain biological species in which the male dies after inseminating the female. Indeed, his whole discussion is largely a matter of quibbling over terminology, for neither Professor De Lee nor anyone else can suggest a less " pathologic " method of propagating the species than the one hitherto in use.

The possibility of a pathogenic element being present during reproduction of the nature of a lessened tissue-immunity was ably and philosophically argued by Dr. Douglas in a paper in the previous number of this Journal. He looked upon this heightened susceptibility as possibly a survival from an earlier biological type in which death occurs after the continuance of the species has been provided for, and suggested that some such factor might have to be taken into account in estimating the risks of maternity. There is, however, a wide gap between Dr. Douglas and Professor De Lee and his confrères, and we fear the latter would scarcely find this tentative suggestion sufficient to raise obstetrics to the " pathologic " pedestal they think necessary for its support. Even in this blest isle, learned and haughty physicians, to say nothing of rude unlettered surgeons, sometimes speak disdainfully and even disrespectfully of obstetrics without our feeling that they hold the part we play without esteem. It is a jest hallowed by long usage, which we accept as of the established order of things because of its ancient lineage.

In spite of its alluring alliteration, we are unconvinced by Professor De Lee's assertion that the "pathogenicity of parturition" will not invite undue interference. Logically his conception leads directly to increased interference in the effort to cut short an abnormal condition and partly explains the wider indications for, and more general adoption of, Cæsarean section in the States, and the wholesale advocacy of version that has emanated from Buffalo. If, on the other hand, the admission is made that during reproduction there is some sacrifice for the sake of the continuity of the race, obstetrics is still left with the inspiring motive of making as low as possible the price paid in maternal life and disability for the nation's new lives. Let those who think this too lowly a service "to invest obstetrics with the dignity it deserves" exaggerate the toll exacted during reproduction in the hope it may aggrandize the office and services of the accoucheur, but let them coin a new term and not misuse one that has a well-recognized connotation. That the whole reproductive process is physiological does not admit of argument.

An *obiter dictum* of Professor De Lee's affords another instance of differences in ideals and service from those of this country and Europe generally. Among other blessings that he thinks would follow the attainment of its pathologic dignity by obstetrics is the disappearance of "that anachronism the midwife." On this side of the Atlantic, legislation and public and professional opinion favour the provision of a service of trained midwives to act as a complement to the medical service, and we would regard the maternity service in the United States as the anachronism, if for no other reason than the sufficiently good one that our lead has not been followed.

The registration figures of the States are unreliable—as the author himself acknowledges—but clearly indicate a high maternal death-rate (6.7 per 1,000 births for 1923). Without a service of trained midwives under supervision, attendance on childbirth in isolated communities, such as exist in many of the States, must be largely in the hands of self-appointed and untrained women under no supervision. Throughout Europe the countries with the lowest maternal death-rate are those with a well-trained corps of midwives. Even in America the chief Medical Officer of the Health Department of New York City has drawn attention to the low death-rate in his area among the Italian population attended by midwives (probably imported ready-made, because they are not a home manufacture.) Writing some years ago on this subject Grace Meigs considered that one of the special problems for America was the provision of trained nurses and midwives for the large areas in which no medical attendant was available. In this country, with two-thirds of our births attended by midwives, the 1923 figure was 3.12, less than half that in the U.S.A. registration area, while special figures, such as those of the midwives of the Queen Victoria's Jubilee Nursing Service can show over 50,000 cases with a mortality (1.4 per 1,000 births) less than a quarter of the American rate. Countries with small scattered communities like Norway and Sweden, or Holland and Italy, with their well-trained corps of midwives, can show a general rate less than half that of America. Professor De Lee ignores also those of his own countrymen who cannot speak his shibboleth, such as Professor Nicholson who uses the term "anachronism" to describe his country's neglect of the midwife and gives an account of the work done in Philadelphia in the supervision and training of midwives and the good results obtained.

Improvement in his country's maternity service will not be hastened by the author's prepossession against the midwife as a participant in that service. He refuses to acknowledge the value of comparative national statistics (p. 152) and cavalierly wipes out all statements regarding the low position of the U.S.A. with the remark that the "figures are worthless for purposes of comparison." He acknowledges that in the four-fifths of the United States of America from which figures are available over 16,000 mothers die annually and "without doubt several thousand women die in childbirth every year and are buried under another diagnosis," and yet lays the flattering unction to his soul that "the quality of obstetric work done in this country is certainly as good as that done abroad." We accept his last statement and acknowledge the deservedly high standing of American obstetrics, but the question our Professor has to face is that of showing how the ample allowance of obstetrical skill in his country can be better distributed so as to make it available to the widely scattered and diverse populations it has to serve, for that is the crucial problem in the provision of a maternity service that will lower the maternal and infantile death- and disability-rate. It is the general level of efficiency that counts; eminences of a high standard of obstetric skill and equipment may catch the eye but will not compensate for wide expanses of low-lying country inadequately provided for. This is the problem that is exercising our minds at the moment, but it is left untouched in this book, and indeed, the principles set out therein seem to be that of making the heights higher still and leaving the hollows deeper than ever, owing to the heavy burden laid on the medical profession in order to maintain the high pathologic dignity of childbirth and the consequential dismissal of the services of the midwife as uncongenial to these high altitudes. The author's system of prenatal care involves continuous observation and many visits—"every three weeks up to the seventh month and every two weeks thereafter," the urine being sent for examination between visits. At each visit records are to be made of blood-pressure, temperature, and pulse, urinary examination, etc., and the patient interrogated for symptoms of complications. "Every labour case should have two physicians," the duties of the second being set out at length, even to sixthly, "to stay in the house for an hour or more after labour to handle a possible post-partum hæmorrhage." Indeed, the puerperium is the first place in which some relief is granted. "The treatment of the puerperium falls almost entirely to the nurse, but it is well for the accoucheur to have his own ideas on the subject and to be able to carry them out, if necessary." Speculation as to the number of medical practitioners required to attend somewhere about $1\frac{3}{4}$ millions births in the U.S.A. with the skill demanded by the pathologic dignity of childbearing, and the time necessary before this number could be adequately trained and distributed will suffice to indicate the impossibility of such general provision of obstetric services as the author's ideals demand. Were his ideals attained the proportion of medical practitioners to the general population in the States of America would certainly exceed even that of civil servants in Austria.

That the teaching of this book shows less variance from our accepted practice than would be expected from the fundamental divergence in the line of approach to the subject is probably to be explained by its author not being afflicted with that philosophical cast of mind that insists on following basic principles to their logical conclusions. Although his

introductory principle obtrudes itself on all possible and impossible occasions—normal and abnormal pregnancy and labour, perineal injuries and the perils run by the infant on its way into this breathing world and so on—it does not hinder his paying homage to the need for "watchful expectancy." The accoucheur "simply studies the processes of nature and determines when, where, and how he may be of assistance, but he must always bear this in mind, that he never can be of 'assistance' unless something in the course of pregnancy, labour or the puerperium goes wrong." Version *à la Potter* is condemned as "unscientific, inartistic and dangerous," and the traditional indications for extraction by the forceps are duly set forth. There is, also, in small print a partial recantation or explaining away of what he had apparently at one time advocated as "Prophylactic Forceps," in which he states that he had "strongly warned against the wide adoption of this procedure, believing that this would result in a high maternal and fœtal mortality, which would defeat the very purposes intended." He goes on to draw a distinction between what is justifiable in the case of the obstetric specialist "in his exquisitely equipped maternity" and the general practitioner, for whom he thinks "'watchful expectancy' should still be the guide," ending with the oracular utterance: "The author is keenly aware that all operations can be abused, but he presented this mode of delivery to the profession confidently trusting each man to do honestly by his patients."

Although a fresh position, differing fundamentally from that originally adopted, is taken up on page 362, where the author states that "Civilization is producing a race of women in whom the response to the necessities of childbearing is becoming weaker as time goes on," no attempt is made to develop it beyond the hint that it may "give important leads for prevention and treatment." As the primary objective in all branches of Medicine is to seek out the causes of disturbed function and remove them before their effects are produced, a splendid opportunity has been lost of discussing how social environment and psychological atmosphere affect detrimentally the reproductive function in women and how these effects might be eliminated or mitigated.

Save in bulk, this is not a great book, but it is a very useful one, particularly to those with sufficient experience and knowledge of the subject to read it critically. It is not well-balanced, the writer every now and then spoiling his case by overstating it and thus failing to be convincing. It presents, however, a wide review of the subject with exhaustive references to recent literature, and clearly meets the requirements of a large body of the English-speaking profession.

JOHN S. FAIRBAIRN.

"Biologie und Pathologie des Weibes." By HALBAN und Seitz. (Parts 7, 8, 9.)

PART 7 contains articles on developmental abnormalities of the female sexual organs, of the urinary apparatus, and of the cloaca; also on doubtful sex by Prof. Kermauner. They form a very valuable contribution to the study of these subjects. We are sorry to see that he devotes a whole page to the illustrations of the operation for making an artificial vagina out of small intestine. These illustrations are more likely to catch the eye than the mortality (18 per cent.) stated in the text. Many of the illustrations are

new; one shows a supernumerary ureter opening on the tuberculum urethræ. The abnormalities of the pelvic organs are treated in such detail that one is surprised to find no mention made of the double or bifid rectum which, when associated with an anus vaginalis, affords a problem of great embryological and practical interest.

In the second part of this part and in Part 9 Prof. Riffersheid writes on the changes in position and shape of the female generative organs. The treatment of retroflexion of the uterus by pessaries and by operative measures is considered and the drawbacks and dangers mentioned. In retroversion of the gravid uterus which is not easily replaced a colpeurynter filled with a kilogramme of mercury is recommended! No mention is made of the replacement by a rubber ring pessary or of the fact that the uterus often rights itself if the bladder is kept empty. There are some good illustrations of the anatomy of the pelvic muscles and fasciæ, but the coloured plates of prolapse are not very striking either from the artistic or clinical point of view.

Part 8 deals with the preparation and after-treatment of gynæcological operations by Prof. Stickel, and general and local anæsthesia in obstetrics and gynæcology by Prof. Thaler.

Both papers are good, but contain nothing out of the common unless it be Professor Thaler's table of parametrial infiltration anæsthesia in vaginal operations which, however, had to be supplemented by inhalation anæsthesia in a third of the cases.

Part 9 has articles on sterility by Prof. Nürnberger in which we find no mention of Pozzi's operation, and on artificial sterilization by Prof. Pankow who gives a terribly long list of diseases and conditions as indications: after wading through this long list it is quite a relief to find that the author does not consider it justifiable to sterilize for hysteria. H. R. S.

"A Glasgow Manual of Obstetrics." By SAMUEL J. CAMERON and others. Roy. 8vo, $9\frac{1}{2}'' \times 6\frac{3}{4}''$. 589 pp. Ed. Arnold. Price 21/-.

THE high reputation of the great Medical School of Glasgow and the eminence of its teachers gives one high expectations of a Glasgow Manual of Obstetrics. These expectations are fulfilled in the present volume. It is well written, well illustrated and well printed. It gives a concise and clear description of what the student of midwifery should know. The illustrations are numerous and good. The students who learn their work from it are to be congratulated on the excellent way in which the subject is put before them, and those associated in the production of the book deserve high praise for their work. Some printer's errors are noticeable:—*e.g.*, p. 31, l. 15, "ovary" should be ovum; p. 80, l. 36, "rotationis" for rotation is; p. 184, l. 22, "urolinin" for urobilin; p. 250, l. 19, "parhysterectomy" for panhysterectomy; p. 383, l. 13, "child" for cord.

In dealing with the management of labour no reference is made to the necessity of turning a patient in the semi-prone position on to her back as soon as the head is born so as to prevent the entrance of air into the uterus. Air embolism is not a frequent occurrence, but it is such an alarming experience for the inexperienced that a warning should be given to avoid air being drawn into the uterus when the child is expelled.

When dealing with the management of the puerperium attention to the bladder should be emphasized, as it is very likely to be overlooked by nurses and doctors, and an over-distended bladder may cause retroversion of the uterus.

Can a full-time sapræmic uterus be cleared by the finger? Saline transfusion by a vein or the breast is recommended in cases of septicæmia. Saline by rectum is not mentioned, an autogenous vaccine is advised. Unfortunately the patient is often dead or dying before an autogenous vaccine can be prepared. Hysterectomy for sepsis is properly condemned. The Carrel-Dakin method of treating uterine sepsis is not mentioned, though it is capable of giving good results.

In the treatment of eclampsia and of persistent vomiting the advantages of witholding food, giving sterile water only by mouth, and using morphia and alkaline enemata are not emphasized, in spite of the fact that the results of that method of treatment have been so good in the Rotunda Hospital.

In the treatment of abortion digital curettage is advised. It is doubtful if an abortion in the first three months can be removed by the finger unless it has already come to lie in the cervical canal. The use of the ovum forceps is advocated, though many practitioners have found that instrument of little value.

Pituitary extract is advised for delay in the first stage of labour. Surely it is doubtful if it should be used so early.

The fact that Champetier de Ribes' bag is not used in Glasgow is somewhat startling. Whatever may be said against it, it is often a very valuable aid to the practitioner.

The depreciation of X-ray diagnosis in pelvic deformity is remarkable. Mackenzie of Belfast has got such excellent and accurate results by comparing photographs of deformed pelves with those of a normal pelvis, that X-ray examination is now the most important means we have of estimating pelvic capacity. It is a method of examination which should receive careful attention in every text-book and medical school.

Cæsarean section for cicatricial contraction of the cervix and vagina can surely very seldom be required. As pregnancy goes on the tissues soften down and labour proceeds normally under conditions which seemed almost hopeless.

The teaching of the Manual is in the main sound. It forms an admirable introduction to the study of obstetrics. JOHN CAMPBELL.

"Modern Operative Surgery." Edited by H. W. CARSON. In two volumes with 735 figures. Cassell & Co. 3 Guineas.

MR. CARSON is to be congratulated on his book, "Modern Operative Surgery," for it is the type of work which is badly needed and fills a gap in British surgical literature. Most of the old books on operative surgery gave too much space to the classical operations, many of which had lost their usefulness except in some cases as operative exercises on the cadaver. Other books on operative surgery have often been too bulky in the attempt of the editor to make them exhaustive works of reference. Mr. Carson's work is confined to manageable size, consisting of two volumes of about 750 pages each. In these volumes surgeons will find information as to the detailed technique of most modern operations together with guidance as to the choice of operation and details of preparation and after treatment. The book is well illustrated throughout, and there is an admirable index to

each volume. Twenty-four surgeons have collaborated as authors under Mr. Carson's editorship, and he himself has contributed most of the sections on abdominal surgery. When there are so many contributors there is always a danger that some section may not come up to the standard of others, but Mr. Carson has been remarkably successful in avoiding overlapping and in securing proportion of scale and uniformity of treatment.

The section on gynæcological operations by Dr. A. E. Giles occupies 75 pages and cannot be expected, therefore, to enter into such detail as to meet the requirements of one intending to specialize in gynæcology. It does, however, present the subject in such a way as to be most useful to the surgeon who practises all classes of operations, or to assist the general surgeon to carry out the special operations of gynæcology when forced by circumstances to undertake them. The same applies to other branches of surgery which have become very much specialized such as the operations on the eye, ear, nose, and throat.

There is a short chapter on anæsthetics by Dr. J. Blomfield which we think should include in a modern text-book on operative surgery a full description of regional analgesia.

Mr. Elmslie contributes the section on orthopædics. The section on joints deals satisfactorily with this subject, and though the book is one on operative surgery we are glad to see a chapter on the conservative treatment of surgical tuberculosis by Sir Henry Gauvain. The surgical treatment of fractures has been ably dealt with by Professor Hey Groves. We think rather too little space has been allotted to operations on the thorax, which is in the able hands of Mr. Richard Warren. The nervous system has been very completely dealt with, and the section on the spinal cord by Mr. Walton, on the peripheral nerves by Mr. Harry Platt, and on the skull and brain by Mr. Bathe Rawling should prove very valuable. Mr. Hamilton Drummond contributes the section on the vascular system. The section on the operative treatment of malignant disease and on operations on the breast from the pen of Mr. Sampson Handley comes up to the high standard we have learnt to expect from this investigator and surgeon.

The surgery of the tongue has been dealt with by Professor Choyce, and Mr. Gillies contributes a valuable section on plastic surgery. The genito-urinary system is very completely and ably dealt with by Sir John Thomson-Walker and Mr. John Everidge. They give a complete account of the various operative procedures on the urinary tract. Mr. Tanner's section on operations on the neck deals ably with the anatomy and surgery of this region.

The book gives a very good account of various operative procedures at present established as sound practice, and can be confidently recommended as a useful guide and clear exposition of modern operative surgery of manageable size.

A. Webb-Johnson.

"Medical Gynæcology." By Samuel Wyllis Bandler, M.D., Professor of Gynæcology, New York Post-graduate Medical School and Hospital, &c. Fourth Edition. Thoroughly Revised. With original illustrations. 8vo of 930 pages. W. B. Saunders Company, Ltd., London and Philadelphia. Price, Cloth, 40s. net.

For many years Dr. Bandler has been an enthusiast regarding the importance of the action of the ductless glands in gynæcology, and in

previous editions of his book gave considerable space to the endocrine glands when they were only briefly mentioned in most text-books. In the interval since the 1914 edition a large amount of research regarding the action and interaction of these glands has been done, and what were previously regarded as interesting theories are now becoming accepted as facts. In the present book the author not only devotes over 100 pages to "The Endocrine Glands" as such but also refers to their action at length when discussing the causation and treatment of almost every disease. It may be noted that in some cases he advises the use of endocrine extracts for months on end, which may make some people sceptical as to their real value, for it is well known that many gynæcological symptoms tend towards spontaneous cure in time, even if entirely untreated. Certainly, glandular extracts are more popular in treatment than they were when Dr. Bandler first advocated their extensive use, and time alone will prove whether their use becomes as universal as the author of this work thinks it should. Meanwhile the articles on the subject show wide reading and careful compilation, they are easy to read and will be welcomed by those whose ideas on such a complicated subject need bringing up to date.

There is also a lucid and brief account of the uses of radium and the methods of using it—in this chapter Dr. Dannreuther collaborated.

Exactly what subjects should or should not be included in medical gynæcology must have been difficult to decide, but surely it is strange to include ten pages on chorionepithelioma when the whole treatment is given in one line: "Treatment of this condition consists of panhysterectomy." There are a good many passages in this work which a gynæcological surgeon will read with startled interest even if he does not imitate. The treatment of a girl with dysmenorrhœa, for example, includes negative intrauterine galvanic electrodes and faradic bipolar electrodes in the uterus. The advantages of dilating the cervix by electricity are frequently insisted on; also plugging the cervix and vagina is urged in many conditions in which many people do not find their use essential—in fact on p. 117 we are given details of a method of plugging (after curettage, which is apparently a medical procedure) by which the intrauterine plug may be "removed after 24, 48 or 72 hours without disturbing the vaginal packing"—presumably the vaginal pack remains *in situ* for four days. Is it really an advantage?

C. W.

"The Young Wife's Advice Book." By Dr. HARRY ROBERTS.

THE first four chapters give very helpful advice to the young wife, stressing the need for education in preparing for maternity and giving a clear and interesting explanation of physical facts.

The physical and mental effects of menstruation are fortunately, as described, the exception not the rule with the normal healthy present-day woman who has so many interests, and less time to dwell on her own health than her early Victorian sister.

The full description of the confinement would alarm a young expectant mother unnecessarily and make her dread the labour.

On the subject of the baby Dr. Roberts is behind the times and on many points not practical, *e.g.*, he advocates two sets of clothing, long and short, while all recognized authorities of the present day have abolished the old-

fashioned long clothes. He does not allow a night feed and yet advises the mother to disturb the baby, to " change the position during the night "; surely there should be eight hours of undisturbed sleep for both mother and child.

The arguments for natural feeding are good and impressive. Among the reasons for *not* breast feeding is " when the supply of milk is obviously inadequate and does not improve under treatment "; in this case the remedy is not to wean but to complement with artificial food to make up for any deficiency. On page 100 Dr. Roberts contradicts his former statement by suggesting alternate feeds of bottle and breast when there is not sufficient of the latter. This would be the sure way to weaning as the breasts would miss the stimulation of the baby's sucking.

The advice as to artificial feeding is vague and unscientific, *e.g.*, on page 101 the amounts in 24 hours increase by 6 ounces between the second and third months—18 ounces to 24 ounces, but for the fourth month the amount is only 25 ounces. In one place it states that starch must not be given under six months of age, in another a mixture of *barley* water, milk, and sugar is suggested as a first substitute for breast milk for the infant.

Chapter XII contains much useful advice but again shows a want of practical knowledge in the details of baby care: " there should be an interval of say half an hour between feeding and holding the baby out." A well-managed baby should be tucked up in its bed and sound asleep before that time has elapsed. Cool sponging at three weeks, the advice given on page 141, is open to question and might be very dangerous.

The chapter on ailments is a very useful one, the writer does not mention that " bed-wetting " may be a nervous condition and should be treated as such. On page 173 Dr. Roberts states that " digestive troubles are responsible for the majority of infantile ailments and arise for the most part from unsuitable feeding." In the light of this statement it would be an advantage if he studied the subject and revised the chapter on feeding in the next edition.

M. L.

" Clinical Report of Queen Charlotte's Maternity Hospital for 1922."

This report of the year's obstetrical work demands but little criticism and that only favourable, for it maintains the usual wealth of detail and accuracy which have characterized it since it became a pioneer in this respect. Many other reports are based upon it, but some apparently have failed to maintain its high standard. Under the treatment of post-partum hæmorrhage it is stated, *inter alia,* that the placenta was removed if this were *in situ.* It would seem desirable that there should be uniformity in the definition of post-partum hæmorrhage, for some schools teach the removal of the placenta for hæmorrhage during the third stage. The section on albuminuria is extremely valuable, as also is the report on special cases at the end. Altogether the material and its classification are admirable, and are calculated to be of great use to those engaged on research work.

JOHN BRIDE.

Review of Current Literature.

DIRECTOR: FRANK E. TAYLOR,
M.D., B.S. (Lond.), F.R.C.S. (Eng.), M.R.C.P. (Lond.), D.P.H. (Cantab.)

THIS Review will contain the lists of contents, and abstracts of the more important articles, from the following journals, with which the "Journal of Obstetrics and Gynæcology of the British Empire" exchanges:—

British.—The Lancet; British Medical Journal; The Hospital and Health Review; Medical Science: Abstracts and Reviews.

Canadian.—The Canadian Medical Association Journal; Bulletin Medical de Quebec.

Australian.—Medical Journal of Australia.

South African.—Medical Journal of South Africa.

American.—American Journal of Obstetrics and Gynæcology; The Journal of the American Medical Association; Surgery, Gynæcology and Obstetrics.

French.—La Gynécologie; Gynécologie et Obstétrique; Bulletin de la Société d'Obstétrique et Gynécologie de Paris; Revue de Gynécologie et de Chirurgie Abdominale.

Belgian.—Bruxelles-Médical.

Italian.—Annali di Ostetricia e Ginecologia; Archivio di Ostetricia e Ginecologia.

German.—Zeitschrift für Geburtshülfe und Gynäkologie; Archiv für Gynäkologie; Zentralblatt für Gynäkologie; Monatsschrift für Geburtshülfe und Gynäkologie; Münchener Medizinische Wochenschrift.

Scandinavian.—Acta Gynecologica Scandinavica.

South American.—Boletin de la Sociedad de Obstetricia y Ginecologia de Buenos Aires.

It is hoped that the Review of Current Literature will keep the readers of this Journal in touch with current work throughout the world. At the end of each year it is proposed to print an Index of all the subjects contained in the articles of the above journals. Arrangements will also be made to include abstracts of important articles on border-line subjects, such as Physiology, Biology and Biochemistry.

LIST OF ABSTRACTORS.

London: J. R. FORREST, DOROTHY N. L. LEVERKUS, M.B., F. E. TAYLOR, F.R.C.S.
Huddersfield: W. E. CROWTHER, M.B.
Leeds: A. GOUGH, F.R.C.S.
Liverpool: ROBERT A. HENDRY, F.R.C.S.
Sheffield: W. W. KING, F.R.C.S.
Glasgow: JANE H. FILSHILL, JAMES HENDRY, M.D.

Lancet.

September 6, 1924.

*Rupture of tubo-uterine gestation, which was concurrent with intra-uterine pregnancy. W. Gifford Nash.

September 13, 1924.

The cellular content of milk : variations met with under physiological and pathological conditions. P. C. Varrier-Jones.

*Eunochoidism in twin sisters. Irene Yates.

Air embolism in obstetrics. (Annotation.)

Pregnancy and pulmonary tuberculosis. (Annotation.)

September 20, 1924.

Milk problems. (Leading Article.)

Benign tumours of the placenta. (Annotation.)

September 27, 1924.

*Vaginal hæmorrhage from perforating endothelioma. W. B. Cosens.

October 11, 1924.

The treatment of post-menopausal hæmorrhage. G. I. Strachan.

Maternal mortality : conference at the Royal Society of Arts. (Special Article.)

October 18, 1924.

*A curious case of partial uterine inversion. H. J. D. Smythe.

*The treatment of hæmorrhage in the new-born infant. J. N. Cruickshank.

The toxæmias of pregnancy. O. L. V. de Wesselow and J. M. Wyatt. (Correspondence.)

October 25, 1924.

A case of duodenal ulcer in an infant. A. M. Thoms.

A case of intestinal obstruction complicating pregnancy. J. C. Jefferson.

The danger of strong applications for ophthalmia neonatorum. J. S. Mayou. (Correspondence.)

November 1, 1924.

*On the question of birth control in some of its statistical aspects. J. Brownlee.

November 8 ,1924.

*Vitamin B and lactation. G. A. Hartwell.

Infant hygiene, ancient and modern. (Special Article.)

November 22, 1924.

*The renaissance of midwifery. H. R. Spencer.

*On the inflation test for tubal pregnancy. V. Bonney.

The status of midwifery. (Leading Article.)

Bacteriology of human milk. (Annotation.)

November 29, 1924.

Teaching on contraception in medical schools. (Annotation.)

Midwifery, ancient and modern. (Annotation.)

Puerperal mortality. E. Simpson. (Correspondence.)

December 6, 1924.

Intrauterine ovarian grafts. (Annotation.)

Insufflation of the Fallopian tubes. W. Blair Bell. (Correspondence.)

December 13, 1924.

*Chronic backache in gynæcology. D. Dougal.

The prevention of stillbirth. G. I. Strachan.

The treatment of tuberculous peritonitis. H. W. Carson.

Syphilis and permission to marry. (Annotation.)

Pseudomyxoma peritonei. (Annotation.)

Treatment of sore nipples in the lactating woman. V. I. Russell.

December 27, 1924.

The chemical composition of blood during labour. E. C. P. Williams.
Treatment of frequency of micturition in women. E. C. Lewis.

Rupture of tubo-ovarian gestation which was concurrent with intra-uterine pregnancy. Nash performed laparotomy for ruptured extra-uterine gestation in a multipara aged 31. A ruptured sac with projecting membrane was found at the right upper corner of the uterus, and occupied so much of the uterine wall that supravaginal hysterectomy was performed. The uterus was found to contain a fœtus of about six weeks' development. The patient recovered.

Eunochoidism in sisters. Yates records the case of two sisters, aged 24 and 22 respectively, in which the younger presents all the characters of a eunuchoid as defined by Tandler and Gross, while the elder has all except the abnormal fat deposit. Eunuchoidism in females is extremely rare, and the author can find no record of its occurrence in sisters.

Vaginal hæmorrhage from perforating endothelioma. A girl, aged 20, in excellent health was seized with sudden and severe vaginal hæmorrhage. A large tumour was found pressing down the anterior vaginal wall. Laparotomy was performed, and a tumour weighing 1 lb. 12 ozs. was shelled out of the retroperitoneal space between the bladder and the vagina. Pathological examination showed the tumour to be encapsulated solid and capillary fibro-hæmangio-endothelioma of the vaginal wall.

A curious case of partial uterine inversion. Smythe records a case of chronic post-partem inversion of the uterus in one half of a uterus didelphys in a iv-para, aged 32. The inverted half of the uterus was removed by vaginal hysterectomy. The patient recovered.

The treatment of hæmorrhage in the new-born infant. Cruickshank describes two main types of hæmorrhage in the new-born :—(1) true birth hæmorrhage, and (2) spontaneous hæmorrhage. The treatment of true birth hæmorrhage is largely prophylactic and consists in the prevention of undue asphyxiation of the fœtus. For traumatic hæmorrhage which has produced increased intracranial pressure lumbar puncture, repeated from time to time, is required. For spontaneous or idiopathic hæmorrhage the immediate injection of whole blood, either subcutaneously or intravenously, is indicated.

Birth control in some of its statistical aspects. Discussing (1) the relation of a high birth rate to infant mortality; (2) the age at marriage in relation to fertility; and (3) how far the fall in fertility in the last fifty years has reduced the chance of the country becoming more seriously over-populated, Brownlee shows (1) that when the data are taken before restriction of birth became a practical factor, there is no evidence that large families were more unhealthy than small ones, and the statement that it is better to have three healthy children than six unhealthy ones has no apparent foundation; (2) that in place of marriage taking place at a higher age, it has, probably due to the war, taken place at a lower age than in 1911, and that the population is now in a more favourable condition for the production of children, and (3) that in place of this being the time for preaching control of birth, the opposite is the case. The time for preaching birth control has passed.

Whether due to birth control or not, the larger part of the fall is due to race physiology, the birth-rate has reached the level required, and any further fall will very seriously endanger the national life.

Vitamin B and lactation. Hartwell shows that the lactating rat *must* have a greater supply of vitamin B than at other periods of her existence or she cannot rear her young successfully. If this be true of human beings a mother taking a diet containing little more protein than the Atwater standard should include in that diet considerable quantities of food (*e.g.*, fruits and vegetables) containing vitamin B.

The renaissance of midwifery. In this interesting Lloyd Roberts Lecture, Spencer gives a word picture of the founder and a delightful account with illustrations, of certain early books on midwifery, including Rösslin's "Rosengarten" (A.D. 1513), Ambroise Paré's "La Maniere de Extraire les Enfans" (A.D. 1551), "De la Generation de l'Homme" (A.D. 1573); Scipione Mercurio's "La Comare" (A.D. 1596), and William Harvey's "De Generatione Animalium" (A.D. 1651).

On the inflation tests for tubal pregnancy. Bonney describes and figures a simple apparatus for testing the patency of the Fallopian tubes and discusses briefly what inflation teaches.

Chronic backache in gynæcology. Dougal points out that chronic backache is an important symptom amongst gynæcological patients, being present in from 20 to 30 per cent. of cases. The importance of backache in uncomplicated retroversion and retroflexion has been much exaggerated as it is found almost as frequently in cases where the uterus is in a forward position. The most important factor in producing backache is fatigue of the pelvic floor muscles, and this may result from increased weight of the uterus but more frequently from stretching of the parametric tissues. When there is a definite indication for surgical treatment the backache can be cured or much relieved in over 70 per cent. of cases, the results being specially good in cases of prolapse treated by colporrhaphy.

The chemical composition of blood during labour. Williams finds a rise in the blood urea and non-protein-nitrogen during normal labour, the average urea content rising from 19.0 mg. per cent. to 28.2 mg. per cent. F. E. T.

British Medical Journal.

September 13, 1924.

"The treatment of pernicious vomiting in pregnancy by gastric lavage and carbohydrate rectal feeding. S. E. Denyer.

Irreducible hernia in infants. D. L. McR. Tod. (Correspondence.)

Treatment of puerperal sepsis. C. H. Roberts and others. (Correspondence.)

September 20, 1924.

Melæna neonatorum treated by injections of paternal blood: recovery. R. J. L. Fraser.

Treatment of puerperal sepsis. R. Hobbs, J. R. C. Canney and others. (Correspondence.)

September 27, 1924.

Prolonged rest in the horizontal position a fertile cause of puerperal sepsis. H. Cortz.

*Discussion on dysmenorrhœa in young women :—

(1) Opening papers. E. B. Turner, A. E. Sanderson Clow, L. Phillips.

(2) Discussion. C. Chisholm, R. Adamson, M. L. C. Madgshon, J. S. Fairbairn, M. E. Weston, W. A. Potts, A. Bourne, J. J. Holland, and M. Watson.

*Imperfect urinary control following childbirth, and its surgical treatment. B. P. Watson.

*Uterine hæmorrhage about the climacteric. J. Phillips.

*Routine pelvic examination during the puerperium. M. H. Phillips.

*Symptoms of pelvic adenomyomata. W. W. King.

Treatment of puerperal sepsis. M. C. Corner, W. H. F. Oxley, and P. I. Benson.

October 4, 1924.

Puerperal fever and atrophic rhinitis. R. Kelson Ford.

Expulsion of whole placenta prævia. H. Craven Petch.

Obstetrics and Local Health Authorities. A. Louise McIlroy. (Correspondence.)

October 11, 1924.

Obstetrics and Local Health Authorities. A. H. Nicoll and C. A. Robinson. (Correspondence.)

October 18, 1924.

Large ovarian cyst and gall stones. J. E. Thomas.

Notification of puerperal sepsis. (Leading Article.)

Obstetrics and Local Health Authorities. A. Crook, W. O. Greenwood, and J. E. Bennett. (Correspondence.)

October 25, 1924.

Ovarian cyst complicating a six and a half months' pregnancy. J. S. Armstrong.

Danger of strong application in the prophylaxis and treatment of ophthalmia neonatorum. J. S. Mayou. (Correspondence.)

November 1, 1924.

Labour obstructed by extension of the forearms. I. H. Lloyd-Williams.

Infant mortality in South Africa and New Zealand. (The Week.)

November 8, 1924.

Lymphaticostomy in peritonitis. W. A. Costain.

November 15, 1924.

Congress of Obstetrics and Gynæcology. (The Week.)

The improvement of obstetrics. G. FitzGibbon. (Correspondence.)

Pernicious vomiting and pregnancy. C. Lundie. (Correspondence.)

November 22, 1924.

Expectant treatment of uterine sepsis. A. Morris Jones.

Free and encysted fluid in the abdominal cavity. S. J. Stewart.

The general practitioner and the maternity service. R. A. Welsh, C. E. Douglas, J. B. Garman, H. F. L. Hugo, D. A. Mitchell, L. L. Hadleigh, R. Anderson, and D. Douglas. (Correspondence.)

Puerperal sepsis. C. E. Jenkins, R. G. Abrahams, and M. Williams. (Correspondence.)

November 22, 1924.

The Lloyd Roberts Lecture on the Renaissance of Midwifery. H. R. Spencer.

The general practitioner and the maternity service. A. Crook, A. P. Agnew, A. C. Stark, G. Ward, O. Clayton-Jones, and C. J. G. Exley. (Correspondence.)

Puerperal sepsis. L. G. J. Mackey. (Correspondence.)

December 6, 1924.

*Cure of uterine prolapse by re-education of the muscles constricting the vagina. T. Stacey Wilson.

Ovarian cyst complicating labour. C. J. Gordon Taylor.

A congenital sacro-coccygeal tumour. F. Brockington.

*Large fibromyoma of uterus. W. R. Parkinson.

The general practitioner and the maternity service. J. S. Fairbairn, J. P. R. Twist, F. Rees, M. C. de Garis, and R. B. Cannings. (Correspondence.)

Puerperal sepsis. J. C. Jegerson, F. J. Browne, J. S. Dick. (Correspondence.)

December 13, 1924.

An address on the treatment of mobile backward displacement of the uterus. A. Donald.

Exercises for the pelvic floor muscles in dyschezia and prolapse. A. F. Hurst and A. C. Adams.

The general practitioner and the maternity service. C. E. S. Flemming, A. P. Agnew, and G. C. Bell. (Correspondence.)

Puerperal sepsis. J. L. Thomas and D. M. Paton. (Correspondence.)

December 20, 1924.

*Early pregnancy and epitheliomata. C. W. A. Emery.

The general practitioner and the maternity service. A. Blair. (Correspondence.)

Puerperal sepsis. W. L. Hodge and R. G. Abrahams. (Correspondence.)

December 27, 1924.

*An address on the teaching of obstetrics. B. P. Watson.

*Two obstetrical emergencies. E. Hamilton-Browne.

A case of hydatidiform mole. A. Boyd Roberts.

The general practitioner and the maternity service. T. MacCarthy. (Correspondence.)

Exercises for the pelvic floor muscles in dyschezia and prolapse. R. H. Paramore. (Correspondence.)

The treatment of pernicious vomiting in pregnancy by gastric lavage and carbohydrate rectal feeding. Denyer considers that the essentials of treatment in cases of pernicious vomiting in pregnancy should be: (1) Rest in bed. (2) Gastric lavage with solution of sodium bicarbonate, 1 drachm to the pint, one or two pints being used. (3) Solution of adrenaline, 5 minims hypodermically every three hours, or orally in doses of 10 to 20 minims in water, until the vomiting ceases. He finds this drug very efficacious in stopping many kinds of vomiting. (4) The omission of all feeding by the mouth, at first, and feeding by rectal salines containing from half an ounce upwards of glucose to the pint, with a small quantity of sodium bicarbonate added if there is any diacetic acid in the urine. (5) The addition to the evening salines of 30 grains of potassium bromide to help sleep and reduce

irritability of the nervous system. (6) The gradual increase of feeding by the mouth, beginning with small feeds of water.

Dysmenorrhœa in young women: its incidence, prevention and treatment. In opening this discussion Clow defines dysmenorrhœa as suffering of any kind associated with the menstrual period. She considers that not only is exercise prophylactic against dysmenorrhœa, but that most cases already developed in young women can be cured by it; and that operation should neither be performed nor suggested until a course of treatment by baths and exercise, with a judicious administration of drugs, has been tried for at least six months and found useless.

Phillips agreed with much of what Clow had said, and for some years has been treating patients along similar lines with gratifying results. He believes there is a definite clinical type of dysmenorrhœa dependent on faulty hygiene and curable by hygienic treatment, but there are also other clinical types due to various causes, some of which are very imperfectly understood and which are not curable by hygienic methods, sometimes not by any method short of stopping the periods completely. The question of pelvic hypoplasia in cases of dysmenorrhœa and the uses of ductless gland extracts is also discussed. As regards drug treatment, the best results were obtained with coal-tar antispasmodics and atropine liquor sedans being sometimes added with great advantage. In many cases of recurrent acute pain of short duration palliative treatment is essential, because hygiene, organotherapy, exercises and baths do not prevent the onset of pain, and exercises during the pain are not tolerated. For severe and intractable cases radium treatment is recommended as an alternative to hysterectomy. Phillips concludes by emphasizing the fact that every case requires careful investigation in order to discover the underlying causal conditions, and to evolve from these a rational treatment.

Imperfect urinary control following childbirth, and its surgical treatment. Watson believes that a very considerable number of women who have borne children suffer from more or less marked inability to control the urine under physical stress, and that the cause of this lack of control is to be found in the relaxation of the fascia supporting the neck of the bladder and not in damage to the sphincter itself. His treatment consists in restoring the tension of the fascia in the region of the neck of the bladder so that the latter is braced up to its normal position behind the pubes.

The investigation, pathology and treatment of uterine hæmorrhage about the time of the climacteritic. The points which Phillips desires to emphasize are: (1) that as regards pathology, in about 25 per cent. of cases abnormal bleeding is associated with malignant disease; (2) that as regards investigation, it is very desirable that the whole extent of the patients' complaints should be investigated; and (3) that as regards treatment, the endeavour should be to restore the patient to normal health and comfort.

The advisability of a routine pelvic examination during the puerperium. For twenty years Phillips has been making routine examinations on the twelfth day of the women who had been confined in the Jessop Hospital, Sheffield, and has become more and more impressed with its value. On the other hand, during the same period he has met with a very large number of other patients who would have greatly benefited had such an examination been made.

The clinical symptoms of pelvic adenomyomata. King has operated on 122 cases of this condition, and has analyzed the clinical symptoms present in these cases. The age limits were 20 and 64 years. Sterility was prevalent. Abdominal pain was the most common complaint. Nausea and vomiting were frequently present, especially accompanying menstruation. Dysmenorrhœa is one of the classical symptoms and was very severe in nearly half the cases. Menorrhagia was present in 52 per cent. Dyspareunia was recorded in 8 per cent. Intermenstrual pain in the rectum was complained of by 15 per cent. of the patients, most of whom had growths in the retro-vaginal space. The pain was more severe, and sometimes only present, during defæcation. There appeared to be a tendency to increasing constipation, but in no case was there any actual obstruction.

Cure of uterine prolapse by re-education of the muscles contracting the vagina. Wilson points out that the muscles which close the vagina (in common with the muscles whose physical relationships are greatly changed during pregnancy and parturition) are liable to lose their normal habit of tonic contraction after the cessation of the distension to which they have been temporarily subjected, causing liability to uterine prolapse. When any voluntary control of these muscles is present the re-establishment of full tonic contraction is only a matter of time, for the frequent repetition of voluntary contraction soon restores a lost habit of tonic contraction. Two cases are recorded where this was done and the effectiveness of the treatment is shown by the fact even when there has been an amount of tearing sufficient to prevent the sphincter vaginæ from taking any part in the support of the uterus, the patient may be able to maintain the uterus in its normal position without the need for a pessary.

Large fibromyoma of the uterus. This weighed 33 lbs. and was successfully removed from a Yoruba woman aged about 30.

Early pregnancy and epitheliomata. Emery believes that the conditions prevailing in the first three months of pregnancy assist in a study of the etiology and treatment of epitheliomata, as there is no other normal condition in which one tissue, if it does not definitely attack, at least invades another. Also the only area which the body normally prepares for the reception of invading cells (chorionic epithelium) does not possess a fat layer. Emery therefore considers that fat is protective, and that epithelial and lipoid substances come so much into evidence in early pregnancy that they produce some form of reaction on the part of the body, and that the fat of the body ordinarily exercises a protective action.

The teaching of obstetrics. Notwithstanding the advances made in obstetrics in the last thirty years Watson points out that reduction in maternal mortality is not yet evident, although one of the causes of this failure is the inadequate training of our students, yet a large share of the responsibility rests on the general community, which must supply the funds for the improvement of medical education, for the erection and maintenance of larger and better maternity hospitals, for the provision of ante-natal care, and for the supply of proper equipment for the conduct of labour in the homes of the poor. Until the economic problem is solved no great advance is possible. Meantime, it is for us to form public opinion by stating the case and suggesting remedies.

Hitherto the teaching of clinical midwifery has been very incomplete, but must in future be taught in the same manner as clinical medicine and clinical surgery. On a more thorough training of our students along these lines lies our hope of reducing puerperal morbidity and mortality from obstructed labour and from untimely and unnecessary interference with normal labour, from the toxæmias of pregnancy, and from the hæmorrhages. The necessity for ante-natal care and supervision is becoming universally recognized, but the necessity for instructing students in post-natal conditions may be emphasized. As ante-natal care is preventive midwifery, so post-natal care is preventive gynæcology.

Two obstetrical emergencies. These were provided by two cases recently treated at the Dufferin Hospital, Calcutta. (1) Rupture of the uterus during labour through the scar of a previous Cæsarean section in an achondroplastic dwarf, aged 19. An uneventful recovery followed suture of the ruptured edges of the uterus. (2) Chronic puerperal inversion of eight years' standing which was successfully replaced manually. F. E. T.

The Clinical Journal.

Vol. liii, No. 47, *November* 19, 1924.

*The symptoms produced by uterine and vaginal displacements. Victor Bonney.

The symptoms produced by uterine and vaginal displacements. Bonney points out that when the supporting apparatus of any organ or part gives way, pain is produced, not only in the apparatus itself, but on the whole structure on which, by default, the task of supporting the organ or part falls. Pain may be due to the primary yielding or to the transference of function. He divides the supporting apparatus of the uterus and vagina into (1) a lower segment, made up of the levator ani muscles and fasciæ, (2) a middle segment, made up of the cardinal ligaments and pubocervical muscle sheet, together constituting the "pelvic shelf," and (3) an upper segment, comprising all those structures attached to the uterus above the level of the vaginal vault, viz., the uterine and ovarian vessels and their perivascular sheaths, the round ligaments, the ovario-uterine and ovario-pelvic ligaments, and the peritoneal folds of the broad ligaments. These structures help to maintain the body of the uterus in the anteverted position, and in this they are supplemented by the presence of the intestinal coils against the back of the uterus.

Yielding of the upper segments allows the uterine body to fall backwards; yielding of the middle segment permits the intra-abdominal pressure to push the upper end of the vagina downwards, so that the vaginal vault inverts into the vagina; yielding of the lower segment leads to eversion of the lower end of the vagina, thus producing cystocele and rectocele.

When one segment yields strain is thrown on the segment which has to take over its function, and there produces pain. The view that pain due to genital displacement is often most marked in its earlier stages must markedly influence treatment in the direction of much earlier operative measures.

The results of genital displacement are local and remote. The local results include pain or discomfort bordering on pain due to drag on the

yielding supports and the structures taking over their function. The pain or discomfort due to displacement is always markedly accentuated directly the woman becomes pregnant, as the tissues immediately become more yielding. Certain local mechanical effects also occur such as frequency of micturition, incontinence of urine in cases of cystocele and a peculiar form of constipation, with difficulty in expelling the fæces from the rectum in cases of rectocele.

The general results of genital displacement produce symptoms due to stasis, such as constipation, chronic indigestion, flatulence, abdominal pain and general sense of "weakness." Abdominal examination reveals enteroptosis and a right movable kidney, and a bismuth meal shows colic, delay and various "kinks." The correct treatment for such cases is the operative repair of the genital deformity which has escaped consideration. Bonney gives this final word of advice: "When a woman exhibiting multiple ptoses comes to you and you are in doubt as to which part of her should first engage your reparative efforts, take my advice and begin at the bottom."

F. E. T.

The Canadian Medical Association Journal.

Vol. xiv, No. 11, *November*, 1924.

*The parturient perineum—its management. E. C. Melhado.

Vagitus uterinus. C. S. Morton.

Vol. xiv, No. 12, *December*, 1924.

*Cerebral hæmorrhage in the new-born. L. P. MacHaffie.

Dysmenorrhœa. (Editorial.)

The parturient perineum. Melhado advocates median episiotomy as a routine in primiparous labours and in others where it appears that laceration will be inevitable. The operation should be employed only in the perineal stage of labour, and is carried out during a pain when the vulva is distended. Repair of the incision by suture is simple and necessitates no special after-treatment.

Cerebral hæmorrhage in the new-born. MacHaffie adopts the etiological classification of Eustis and Munro of Boston into (*a*) a traumatic group; (*b*) an asphyxia group, and (*c*) a fœtal disease group, including the hæmorrhagic diathesis of the new-born, the toxæmias, syphilis, etc.

He considers that one ought to be on the look-out for cerebral hæmorrhage should any of the following signs or symptoms occur: (1) An infant born asphyxiated; (2) Refusal to nurse satisfactorily; (3) Sluggish breathing, abnormal breathing or cyanosis; (4) Convulsions or twitchings; (5) Hæmorrhage from mouth or rectum; (6) Undue drowsiness or feeble cry or extremely sharp cry; (7) Marked pallor, rapid loss of weight.

He hopes the time will soon come in all maternity hospitals when it will be considered advisable to take coagulation and bleeding times in all newborn infants, chart them and repeat them for a week or ten days; and if a sharp look-out be kept by the nursing and interne staff for any of the cardinal signs of intracranial hæmorrhage and immediate lumbar puncture be performed in suspicious cases many lives will be saved; fewer cases of spastic diplegia, epilepsy, mental deficiency and instability will be seen, and probably fewer screaming babies, difficult feeding cases and nervous wrecks.

F. E. T.

American Journal of Obstetrics and Gynæcology.

September, 1924.

The relation of venereal diseases to childbirth. E. A. Schumann.

*Morphine and magnesium sulphate as an obstetrical analgesic. T. W. Adams.

*The placental infarct and its relation to the etiology of deformed babies. J. E. Talbot.

End results of 201 cases of carcinoma of the cervix. H. C. Taylor.

*The phenoltetrachlorphthalein test of liver function in the toxæmias of pregnancy. J. A. Smith.

Recurrent toxæmia of pregnancy. F. S. Kellogg.

Uterine prolapse, cystocele, rectocele. An analysis of sixty-three consecutive cases operated upon by the vaginal route. L. H. Planeuf.

The construction of an artificial vagina with report of a case. C. J. Miller.

A new method of ensuring sterility following Cæsarean section. F. C. Irving.

*A method of treatment of severe types of dysmenorrhœa; with a report of results in 230 cases. F. A. Cleland.

Vaginoscopy in the treatment of gonorrhœal infection of the lower genital tract in infants and young girls. L. M. Randall.

An ovarian cyst of unusual size removed under local anæsthesia. E. L. Stone.

An improved head stethoscope for the hearing and counting of fœtal heart tones. F. H. Falls and T. A. Hunter.

Six cases of puerperal infection. J. Ronsheim.

A case of unilateral amastia. H. W. Louria.

Selected Abstracts.—Breast.

October, 1924.

*Hyperplasia of the endometrium—a clinical and pathological study. Emil Novak and Karl H. Martzloff.

*Report of some observations of the effects of radium therapy in cases of large uterine fibroids. Curtis F. Burnam.

Ethylene and oxygen anæsthesia for gynæcological and obstetrical work. Sproat Heaney.

Mental diseases associated with child-bearing. Menas S. Gregory.

*Chorioangiofibroma (chorioangioma). R. S. Siddall.

Pregnancy glycosuria with hyperglycæmia. S. B. Schenck.

Early carcinoma of the cervix. Elise S. L'Esperance.

The status of rectal examinations in labour. R. A. Reiss.

The rôle of the internist in an obstetric hospital. W. W. Herrick.

A case of pernicious vomiting of pregnancy with low blood chlorides and marked response to sodium chloride therapy. R. L. Haden and D. C. Guffey.

The cure of incontinence of urine in women. C. J. Miller.

Two-way treatment catheter. W. H. Cary.

An unusual example of exstrophy of the bladder with marked separation of the pubic bones. E. C. Sage.

A case of pregnancy in double uterus terminated by hysterotomy. W. P. Guy.

Selected abstracts—eclampsia.

November, 1924.

Milk injections in gynæcology and obstetrics. G. Gellhorn.
Recent observations of certain pathological conditions of the amnion. R. Paddock.
*Chorioangiofibroma (chorioangioma). R. S. Siddall.
Nephralgia with high blood pressure. De Witt B. Casler.
*Function of the ovary. R. T. Frank.
Contraception : a medical review of the situation. R. L. Dickinson.
Acquired atresia of the vagina and cervix. F. A. Pemberton.
Occiput posterior : a case analysis. H. C. Cowles.
An enclosed bed for premature and feeble infants. H. J. Morgenthaler.
*Contractions of the pelvic outlet necessitating delivery by Cæsarean section. E. L. Stone.
The cautery treatment of chronic cervicitis with histologic studies. B. Z. Cashman.
Double uterus. C. van Swalenburg, T. A. Card, and W. A. Jones.
*Hydatid mole with spontaneous rupture of the uterus. I. B. Krellenstein.
Independent fibromyomata of the broad ligament. H. C. Seaver.
Spontaneous version. P. Findley.
Collective Review—Pelvic varicosities—varicocele pelvica. J. O. Polak and W. W. Phelan.
Selected Abstracts—General gynæcology.

December, 1924.

Carbohydrate metabolism during pregnancy and the value of insulin to the obstetrician. H. Ehrenfest.
A morphologic study of some phases in the development of the sex glands of the domestic pig. K. Wilson.
The results obtained in a conservative teaching clinic among 2,500 negro patients. J. R. McCord.
A further study of the origin of uterine bleeding in tubal pregnancy. J. O. Polak and S. A. Wolfe.
A clinical consideration of the contracted pelvis. H. C. Burgess.
The cause and prevention of post-operative gas pains. C. D. O'Keefe.
The causation and treatment of rupture of the uterus. B. C. Hirst.
A rare congenital anomaly. H. A. Peck.
Acute hydramnios and homologous triplets. L. M. Randall.
The diagnosis of early pregnancy by Roentgenography. R. Peterson.
Selected Abstracts—Physiology and pathology of labour.

Morphine and magnesium sulphate as an obstetrical analgesic. Adams has experimented with smaller doses of magnesium sulphate along the lines of Gwathmey's work. The best results have been obtained with 2.0 cc. injections of a 25 per cent. solution of magnesium sulphate together with one-sixth of a grain of morphine. The injections were given to sixty patients of whom all but six were primigravidæ. Twenty-five per cent. of the women had no pain until the head began to distend the perineum and four per cent. obtained no relief whatever from the injections. Various graduations were noted between these two extremes. There appeared to be no evidence of any increased danger to the mother or the child.

The placental infarct and its relation to the etiology of deformed babies. Talbot, impressed with the association of fœtal deformities and an eccentric

insertion of the cord into the placenta, has evolved a theory that hæmorrhages into the " placenta " during the first month prevent its symmetrical growth. He has long held the belief that toxæmias of pregnancy are due to chronic sepsis and that infarcts are, therefore, a result of sepsis, and, *ex hypothesi,* sepsis causes the deformities by destruction of an area in the early " placenta " will be liable to limit the growth of the embryonic area supplied and hence to cause deformities. He reports twenty cases in which the placentas showed evidence of damage within a radius of one inch and a half from the base of the cord and in all of the babies he found different deformities ranging from anencephalia to asymmetry of the hemispheres. This evidence, he thinks, tends to show that most malformations are the result of lack of embryonic development rathert han to hereditary defects; and that the defects in development are due to injury to the placenta during the early weeks of pregnancy resulting from septic infection arising in the teeth or tonsils.

The phenoltetrachlorphthalein test of liver function in the toxæmias of pregnancy. Judson Smith, employing the method of Rosenthal for this test of liver function, has injected twenty normal pregnant women, and forty-four who were suffering from toxæmia. He concludes that abnormal retention of the dye suggests that a toxæmia is severe and hepatic rather than nephritic. The degree of retention does not appear to be a reliable index of the amount of actual necrosis of the liver. A normal test on the other hand is of doubtful value unless obtained a few days before the onset of labour.

A method of treatment of severe types of dysmenorrhœa with a report of results in 230 cases. The author limits his paper to the consideration of severe (incapacitating) uterine colic in patients whose pelves are otherwise normal. He has effected a cure, where both he and others have failed, by dilatation of the cervix followed by the division of the internal os with a knife. The wound is made to heal from the bottom by firm packing with iodoform gauze. He has performed the operation upon 230 patients, of whom he has been able to trace 175. Over 78 per cent. of these were either cured or markedly relieved. In only eight cases (4.5 per cent.) was the operation a complete failure.

Hyperplasia of the endometrium a clinical and pathological study. Some facts have been proven and many theories have been evolved to account for menorrhagia without gross changes in the pelvis, but the plethora of the latter have obscured the paucity of the former. Novak's article as a record of fact is therefore a welcome addition to the already enormous literature. Under the term hyperplasia he describes a condition of the endometrium characterized by overgrowth of the epithelial and stromal elements. Grossly the endometrium may be enormously increased in amount and may present the picture so often and so incorrectly described as " polypoid endometritis." In almost half the author's cases it was of normal thickness and smooth rather than polypoid. Histologically the characteristic and ever-present change in the epithelium is the presence of dilated glands which are uninfluenced by the phase of the menstrual cycle. The stroma may be more abundant and show more mitosis than usual. The only clinical symptom is bleeding, which, though it is generally periodic, may

be continuous. The treatment recommended is along the lines usually adopted in such cases.

Report of some observations of the effects of radium therapy in cases of large uterine fibroids. The author states that he can cure more than 50 per cent. of uterine fibroids by appropriate radium radiation; with practically no risk and very little discomfort or loss of time. He is even able to destroy the fibroid but at the same time to retain the power of menstruation and reproduction.

Chorioangiofibroma. The author chanced upon an irregular oval swelling 10.0 cm. by 7.5 cm. in the centre of a placenta. On section the tumour was well marked off from the placental tissue by a sort of capsule. There was a definite layer of placental tissue both between it and the maternal surface and between it and the amnion.

On miscroscopic examination the tumour was found to be composed of the same tissue as a normal villus but in abnormal proportions. For the most part the interior of the tumour was made up of a loose areola tissue and endothelial-lined spaces about the size of capillaries, but containing no blood. The author regarding these as developing blood vessels regards the tumour as a chorio-angio-fibroma.

The author gives a tabulated list of 130 tumours of this type which he has been able to collect from the literature, and he reveals a detailed study of all the facts of importance. His conclusions are that these tumours are very rare. That they develop from the connective tissue epithelium and blood vessels of the placental chorion but their ætiology is uncertain. They do not affect the mother but they tend to cause hydramnios and premature births.

A very large bibliography is given.

Function of the ovary. Frank's views may be summarized as follows :— The primary development of the female genital system depends upon the action of a hormone elaborated by the growing follicle. The corpus luteum hormone produces a periodic accentuation of this effect and prolongs the growth stimulus during early pregnancy. The placenta produces further development of the genitalia in pregnancy.

If no pregnancy developes, as soon as the corpus luteum becomes functionless the hypertrophied mucosa breaks down and bleeding (menstruation) takes place. The periodicity of menstruation is due to the fact that after the follicle has ripened ovulation takes place, and the corpus luteum inhibits other follicles from developing until it becomes inactive. Lipoid extracts of the follicle corpus luteum and placenta produce marked hyperplasia of the genitalia in experimental animals. It is not surprising that our present methods of ovotherapy are ineffective since the same dosage per kilo that produces a reaction in animals would necessitate the use of the extract of ten kilograms of ovary per day in the average woman!

Contraction of the pelvic outlet necessitating delivery by Cæsarean section. Moderate degrees of transverse contraction, in which the bituberal diameter measures more than 7.0 cm., are often corrected by the exaggerated lithotomy or analagous position. In other cases the difficulty is not so easily overcome. The author reports a case in which Cæsarean section was

necessary to effect delivery. He records another case in which the outlet contraction was only part of a pelvic deformity due to osteo-malacia.

Hydatid mole with spontaneous rupure of the uterus. The author has only been able to find four other such cases in the literature. After the patient had had a six-weeks' ovum removed she did not again menstruate. Two months later she was suddenly taken with acute abdominal symptoms for which laparotomy was performed. The abdomen was full of blood and the uterine wall was found to be perforated by a vesicular mole. Subtotal hysterectomy was performed and the patient recovered. W. W. KING.

The Journal of the American Medical Association.

Vol. 83, No. 12, *September* 20, 1924.

*The endometrium of the menstruating uterus. E. Novik and R. W. Te Linde.

The endometrium of the menstruating uterus. Novik and Te Linde consider that while there is little difference at present concerning the uterine changes in the post-menstrual interval and pre-menstrual phases, there has been much discussion for the last fifty years concerning the behaviour of the endometrium during menstruation. The chief point at issue has been as to whether all or part of the uterine mucosa is cast off.

Examining uteri removed during menstruation Novik and Te Linde found that extensive loss of tissue is the rule. The entire superficial or compact layer, as well as most of the deeper or spongy layer, is thrown off, all the compacta and most of the spongiosa being gone on the second day. Regeneration changes are usually evident on the third day, and may be quite marked.

The desquamation of mucosa is preceded by extensive infiltration with polymorphonuclear leucocytes and lymphocytes, this infiltration being marked for a short time before the actual onset of menstruation. The throwing off of the mucosa does not usually occur as an extensive shedding in large masses. It is a sort of crumbling, molecular process, small strips and bits of degenerated mucosa being cast off until only the basalis, and perhaps a few spongosial remnants, are left. The desquamated endometrial portions may be recovered from the menstrual discharge. Pyknotic changes are prominent at the beginning of menstruation.

Regeneration is remarkedly rapid, especially the epithelization of the surface. The source of the new epithelium is chiefly the epithelium of the basal stumps of the uterine glands. Mitosis is not a very frequent occurrence, appearing to a greater extent when the epithelial layer is already complete.

While diapedesis may play some part in the mechanism of the menstrual bleeding, rhexis is the most important factor. F. E. T

Surgery, Gynæcology and Obstetrics.

Vol. xxxix, No. 3, *September*, 1924.

*Sarcoma of the Fallopian tube; history and literature. W. E. Dodd.

*Lymphangioma of the Fallopian tube. W. L. Strong.

*Fibroids in the puerperium. E. W. Fischmann.
Some questions relating to the surgical drainage of the peritoneum. R. L. Payne.

Vol. xxxix, No. 4, *October*, 1924.

*Transposition of the ovary with its vascular pedicle into the uterus after salpingectomy. T. Tuffier.
Cancer of the uterus. W. J. Mayo. (Editorial.)

Vol. xxxix, No. 5, *November*, 1924.

*Pseudomyxoma peritonei. E. Reis.
*A brief review of the literature of osteomalacia with the report of a case necessitating delivery by Cæsarean section. E. L. Stone.
*Adenomyoma of the rectovaginal septum, association with pregnancy: radium treatment, apparent recurrence; adenomyoma of the uterus, relation to malignancy. L. Herly.
Excision of cervix for endocervicitis. S. Rottenberg and G. Schwartz.
An illuminating device for the vaginal speculum. M. N. Hyams.

Vol. xxxix, No. 6, *December*, 1914.

*Five years end-results obtained in carcinoma of the female pelvic organs with special reference to radium and X-ray therapy. H. Schmitz.
The intravesical (cystoscopic) treatment of carcinoma of the bladder by implantation of radium emanation tubes. A. Hyman.
A simplified apparatus for testing the patency of the Fallopian tubes with accuracy. R. T. Ferguson.

Sarcoma of the Fallopian tube. A review of the literature on primary sarcoma of the tube reveals twelve authentic cases. Since 1900, there have been 1,871 salpingectomies performed at the Lankenau Hospital, most of which were bilateral. All these specimens were studied both grossly and microscopically, and there are only two cases of sarcoma in the records. The patients in whom these tumours occurred were both past the menopause, being 55 and 60 years of age respectively.

Lymphangioma of the Fallopian tube. The occurrence of a lymphangioma in the Fallopian tube is sufficiently rare to justify Strong in reporting two cases which have been found in the routine examination of tissues at the Woman's Hospital, New York. In both cases the lymphangiomata were associated with inflammatory conditions of the tubes.

Fibroids in the puerperium. Fischmann concludes that fibroid tumours in the puerperium may cause serious complications, frequently a febrile course. Fibroid tumours may suffer changes during gestation and labour and these may progress and be augmented by secondary infection during the puerperium. He considers that when a woman with a fibromyomatous uterus becomes pregnant and goes to term, Cæsarean section with an immediate myomectomy or hysteromyomectomy is the operation of choice, and that when the myoma is not discovered until during labour or the puerperium, conservatism should be practised as long as possible.

Transplantation of the ovary with its vascular pedicle into the uterus after salpingectomy. Tuffier has devised an operation which is intended to preserve menstruation and the possibility of pregnancy in women after double salpingectomy. The ovary is included in the thickness of the uterine muscle, it projects partly into the uterine cavity, and is studded with

corpora lutea. The ovarian tissue contains a voluminous cyst of ovular origin and a considerable number of microcysts with Graafian follicles. The uterine mucosa, normal throughout, makes a little polypoid projection at the level of the ovarian "relief." The author has performed this operation twenty-three times, with good results. Excellent illustrations accompany this paper.

Pseudomyxoma peritonei. Ries shows that pseudomyxoma peritonei is a secondary condition due to the escape of gelatinous material from a primary tumour, arising in the ovary, the appendix, or rarely in other organs. The ovarian tumours are always pseudomucinous cystomata. The appendices from which pseudomyxoma peritonei start are always cystic, often show diverticula, and may contain papillomatous tumours.

The operative treatment is successful in proportion to the completeness of the removal of the primary tumours and the pseudomyxoma peritonei. Every case of pseudomyxoma peritonei requires investigation of the appendix and its removal. The chemistry of the gelatinous masses deserves further study with attention to the sources of the colloidal material. The co-existence of ovarian tumour with appendiceal cyst in pseudomyxoma peritonei is a frequent finding. There is no evidence of more than accidental co-existence of the two conditions.

Osteomalacia. Stone reviews the literature of osteomalacia. Statistical and experimental evidence has also been quoted which indicates that the prophylaxis and cure of this syndrome lies largely in the problems of dietary deficiency and vitamine balance.

The detailed history of a patient with puerperal osteomalacia is reported, including X-ray studies revealing the bony changes characteristic of the disease. Its occurrence in a locality where such lesions are rarely seen suggests that the disease is more common than is generally supposed.

Adenomyoma of the recto-vaginal space. Herly adopts Cullen's classification of adenomyomata of the recto-vaginal space. He considers that if the entire growth is removed no further trouble need be feared. If portions be left these will continue to grow and will lead to more pelvic adhesions and finally produce complications that may result in death or permanent invalidism.

Herly also records a case of adenomyoma of the uterus associated with pregnancy for which Cæsarean section was successfully performed at term, and also a case of adenomyoma of the uterus associated with microscopically malignant changes.

End results in carcinoma of pelvic organs. The five-year end results of radiation treatment of carcinoma of the female pelvic organs show that the absolute curability in a series of 180 cases is 15 per cent., the relative curability in 37 cases of Group I and II is 46.0 per cent.

The radiation treatment of carcinomata of the female pelvic organs compares favourably with the surgical treatment if the percentages of cases suitable or not for operation are taken into account.

The grouping of carcinoma cases should be based on the results of the physical examination and not on the subjective interpretation and operability or non-operability.

The radiation treatment of recurrent carcinoma of the female pelvic organs has given only temporary subjective palliation, evidently due to the delay in applying for treatment soon after the operation. It is suggested that patients who have had incomplete surgical operations be subjected immediately after operation to radiation. F. E. T.

La Gynécologie.

September, 1924.

Louis Gustave Richelot, 1844—1924.

The radio-radium-surgical treatment of cancer of the breast. M. de Beule.

October, 1924.

*Serotherapy and vaccinotherapy in the treatment of puerperal infections. H. Roulland.

Serotherapy and vaccinotherapy in the treatment of puerperal infections. Serotherapy is a treatment of urgency : it is rapid in action, but the results are inconstant. It has the disadvantage that it may cause serum-sickness. According to Bordet, after prolonged serum treatment, the streptococci may be roused to greater activity and virulence. To obtain the best results with antistreptococcic serum the following advice is given :—

(1) To use the serum very early—as soon as the temperature rises, without delaying to find the cause.

(2) To use large doses (60 to 100 cc.) during the first three or four days.

(3) Intravenous injection gives the most rapid and striking effects.

(4) The serum should be applied locally, either by injecting once a day 50 cc. into the uterine cavity, or by leaving in place for eight or ten hours a gauze pack soaked in serum.

Vaccinotherapy is indicated when the organism cannot make a sufficiently vigorous effort to overcome the infection, but there must still be sufficient strength to react to the treatment. It is not suitable in septicæmia, but is advantageous in chronic and localized infections.

In some of the worst cases immuno-transfusion is available. A donor receives an injection of vaccine, and within three hours his blood already contains antibodies. In performing the transfusion, defibrinated is superior to citrated blood.

The latest method is local vaccination. The uterus is packed with gauze soaked in filtered cultures of the organism : the packs are renewed twice a day. It is too early to pronounce on the value of this method.

A. Gough.

Annali di Ostetricia e Ginecologia.

March, 1924.

*The fœtal hormones. N. Erede.

*A pseudocystic uterine fibromyoma with colloid infiltration. G. Rabbi.

April, 1924.

*Secondary hæmorrhage after laparotomy. F. Giuseppe.

*A case of pyelonephritis caused by typhoid bacillus in a pregnant woman. F. Vozza.

The Society of Obstetrics and Gynæcology of Piedmont.

May, 1924.

Endovenous proteintherapy in puerperal sepsis. G. Dossena.

*Some notes on over 100 cases of epithelioma of the portio treated with radium. I. Odescalchi.

*On primary sarcoma and endothelioma of the vagina in adults. D. Giuseppe.

Thirteenth Obstetrico-Gynæcological Congress at Naples, 5-6 May, 1924.

June, 1924.

Perforator-tractor—Cassioli's model. C. Cassioli.

*A new hypothesis on the cause of menstruation. P. Carlini.

Radioactive cures in the Obstetrico-Gynæcological Institute of Milan. I. Odescalchi.

The fœtal hormones. Starting with the influence which the gametes can exercise among themselves in the act of fecundation, the author quotes Pfeffer as having demonstrated that malic acid is an excitant which strongly attracts the antherozooids of ferns and is produced in nature from the archegones of individuals of the same species.

Positive chemotropism of the spermatozoa of marine animals towards specific substances which characterize the egg of the same species explains what would otherwise seem marvellous. Dungern, to illustrate this chemotropic doctrine, found in ova of starfish substances deleterious to spermatozoa of Echinus. But recent researches throw doubt on the influence of chemotropism in the production of fecundation.

In the method of artificial pathenogenesis of Loeb are two successive stages: the first consists in provoking by means of a substance which sets free the fats, the formation of the membrane of the egg; the second the favouring of the process of oxidation of the egg by means of a hypertonic solution. According to Loeb, this action, a true excitation of development, is of a chemical nature and not physical. If that opinion is right, we see in the excitation of development a process of the same nature as those formative influences which, in the further life of the individuals, are exercised by the hormones.

Hofbauer, in 1904, showed how the placenta exercises a complex influence on the elements of nutrition, and, far from being a simple passive membrane, it participates actively in the decomposition and recomposition of albuminoid substances. In the metabolism of the fœtal placenta, moreover, are produced substances which directly or indirectly influence the conditions of the fœtus; such as those demonstrated by Savaré, which promote coagulation of the blood, and the substance with hypotensive action found by Schikelè.

Halban, in "Reaction of the fœtal organs in pregnancy," says that in mother and fœtus there are reactions of the same type. These reactions would be determined in response to a stimulus derived from an internal secretion of the placenta. The reactions in mother and fœtus are hyperæmia and hypertrophy of uterus, hypertrophy of mammæ, and in the male hypertrophy of prostate.

Among the organs of the fœtal organism which are completely developed and functioning at birth are the sexual glands. The ovary and testis may be considered as classical examples of organs with internal secretion. From the moment the ovary appears in the embryo there goes on in it a continual evolution. Even before birth the follicles are found to be

increasing, and in the first years products of involution of the follicles are found. So that even at an early stage of the embryo the sexual glands furnish hormones which besides having an influence on the general development of the organism, exercise by means of specific products a well-defined action on the development of the ducts of Müller and of Wolff, and on the first appear the secondary sexual characters.

The suprarenals are considered as the most important trophic centre of the nervous substance: when they are undeveloped and their hormonic action is wanting, a much-altered cerebral morphogenesis would be explained. This regulating function of the suprarenals persists in extra-uterine life.

Another hormone is that of the thyroid. Halsted and others have removed a part of the maternal thyroid in gravid animals, and have found that the young have a hypertrophied thyroid, indicating that the fœtal thyroid has a vicarious function for the maternal thyroid.

With the exception of the placenta the existence in intra-uterine life of a hormone functioning like that of the thyroid, the hypophysis, the thymus, or the pancreas cannot be demonstrated.

Passing to the reciprocal influences between fœtal and maternal organisms by means of hormones we are on surer ground. Thomas pointed out the increase of the maternal endocrine glands during pregnancy. Starling and Lane-Claypon, by injecting into virgin rabbits extracts of embryos, of placenta, of uterine mucosa and of ovary, obtained hypertrophy of the mammary glands. Foa showed that bovine fœtal extracts had the same effect. Abderhalden's reaction, while undependable as diagnostic of pregnancy, shows that there are reciprocal hormonal influences between mother and fœtus.

The mutual action of the embryonal cells (gametes) during fecundation seems to be of the same nature as the action of the hormones in the adult. The experiments of Basch, of Meyer, and of Halban show that the placental secretions have a real influence on the development of the fœtus. With due limitations, we may consider the mother and fœtus as symbiotic organisms; but that does not exclude influences of humoral and hormonic character.

In the materno-fœtal relations we may distinguish two periods. The first, initial, in which the embryo, parasitic on the mother, turning into the maternal circulation its products of elimination determines the picture of "sympathetic" phenomena. The second, immediately continuous with the preceding, in which is established an equilibrium between mother and fœtus, and which normally is not disturbed until birth. In this period, however, either by persistence of embryonal characters on the part of the fœtus, or by the excessive production of fœtal substances, hormonic or not, which are discharged into the maternal circulation, or by the production in the mother of substances deficient in the fœtus in a vicarious manner, or by all or part of these causes united, we get the phenomena which in the case of the mother are called "toxicosis," and in the fœtus cause modifications of its development.

A pseudocystic fibromyoma with colloid infiltration. A married woman, aged 44, entered the clinic on 18 March, 1923. She began to menstruate at 13. Four normal pregnancies, the first at 17, the last 20 years ago. For last four years she has had menorrhagia, bright red blood, no clots. No leucorrhœa. For the last two months a rapid swelling of the abdomen reaching

above the umbilicus. The breasts were more turgid for the last four months. There were constipation and frequent micturition. The breasts yielded milk.

The abdomen was distended by a median swelling of the size of a uterus at seventh month of pregnancy, uniformly smooth, elastic consistence, obscurely fluctuating, rather mobile. No ballottement, nor active movements. Tumour dull on percussion, no modification on change of movement. No fœtal heart sounds; a uterine souffle in right lower quadrant.

Vaginal examination showed cervix continuous with tumour.

Diagnosis. The rapid increase of the tumour, its symmetry, its regularity of surface, the undeniable although not well marked sensation of fluctuation militated against fibromyoma of uterus, suggesting the possibility of a cystic tumour of the ovary. If to above characters we add mammary hypertrophy, and the obvious lacteal secretion, we are faced with another doubt: Is there a pregnancy in a fibromyomatous uterus? In addition to the points noted above against pregnancy, there was no softening of cervix, and the reaction of Abderhalden was negative. A sound showed the uterine cavity to be 18-cm. long, and passed without obstacle. The diagnosis of a soft fibromyoma of the uterus was made.

Operation. On 28 March, 1923, supravaginal amputation. Patient made an uninterrupted recovery and was discharged on the eighteenth day.

Description of tumour. Weight 1,300 grammes; it was developed interstitially in the posterior wall of the uterus, size of a child's head, very thin capsule. On median section was seen a central compact nucleus of fibrous aspect around which was formed an irregular pseudo-cystic cavity, insinuated among the fibrous tissue, filled with a greyish-green substance of gelatinous consistence, bounded towards the outside by a coat of fibrous tissue, very thin superiorly and anteriorly.

Histological examination. The peripheral part beneath the peritoneal investment was formed of strata of parallel connective tissue laminæ, with numerous discrete vessels. On examining the sections farther and farther from the compact tissue of the fibromyomatous mass to the zones of colloidal aspect there was noted an ever-increasing dissociation of the fibromyomatous tissue in which numerous vessels were seen, some of embryonic structure. The muscular fibres were scanty, swollen, with the nucleus always deformed and indistinct. The connective tissue bundles had undergone an analogous transformation until there was found merely amorphous tissue traversed by rare bundles of fibrils which at points more degenerated had disappeared entirely.

Fibromyomata in pseudocystic degeneration are almost always accompanied by menorrhagia, which is very rarely the case with cystic ovaries.

Sometimes the gelatinous contents of the degenerated part of the tumour may give rise to fremitus like a hydatid thrill as well as to fluctuation on abdominal palpation.

Secondary hæmorrhage after laparotomy. In 5,200 laparotomies the author had 15 cases of secondary hæmorrhage. Of these, eight followed operation for ovarian tumours, four were fibromyomas of uterus, three removal of annexa for suppuration.

The author also records a case of pyelonephritis caused by typhoid bacillus in a pregnant woman, and states that only two cases of pyelonephritis caused by typhoid bacillus in pregnant women could be found in the literature, to which he now adds a third.

Some notes on over 100 cases of epithelioma of the portio treated with radium. Of these 100 cases, none was in an early stage, 21 were within the limits of operability, 56 were clearly inoperable with extensions limited to the fornices and to the cellular tissue of the parametrium, rectum, or bladder; 18 cases presented diffuse lesions, pelvic block, etc.; five cases were regarded as relapses after hysterectomy.

Results obtained were: in the 21 cases still operable 20 were cured, one case could not be traced after treatment. Of the 56 inoperable cases, 25 showed complete disappearance of the lesions; 16 were notably ameliorated, alleviation of pain, diminution of losses, and improvement of the general condition persisting; three obtained no relief; six had local and general improvement for a period of three to nine months; six died, and of these two died from septic complications of the treatment. Of the 18 cases with extensive lesions, one was lost to view; seven were notably improved for a period lasting from 13 to 3 months; eight got no relief; two died, one of cachexia, and one from uræmia following application of radium. Of the five cases of relapse, in three the lesions disappeared, in two the process continued to spread.

Diffusion towards the posterior parametrium with early infiltration of the utero-sacral ligaments was observed in some cases and was always rebellious to treatment.

Patients new to radium and in generally good condition support doses of 70—80 m.c.d. administered in 7-8 days, presenting on the last days of administration, and for 15 days following, prostrative anorexia, often vomiting, rise of temperature to 38° C., while the hæmatological picture is similar to that produced by profound Roentgentherapy. On the other hand, doses of 25—35 m.c.d. given in 4-6 days are generally borne well, the patients complaining only of a feeling of tiredness on the days immediately following the application.

In the first period of treatment the author applies radium to the vaginal cavity, possibly in the fornices. One or two tubes containing 6.66 mgr. radium element each are placed against the portio and eventually into the lower portion of the cervical canal if this is discoverable and permeable; in proliferating, cauliflower forms needles containing 1.33, 3.33 mgr. of radium, and 2-3 cm. long, are substituted for tubes.

When retrogression is complete and consequently all purulent loss has ceased, he proceeds to treatment in depth: this consists in placing tubes of radium in the uterine cavity and in the upper part of the cervical canal, and in inserting long needles containing 4-6 mgr. of radium in the form of a crown around the portio with a direction parallel to the cervical canal so that their extremity reaches the thickness of the uterine tissue in the neighbourhood of the isthmus. The quantity of radium, the duration of application and consequently the dose administered, are equivalent to those of the first period.

The complementary action assigned to X-rays intervenes between the first and second periods of treatment with radium. The necessary period of waiting of six to eight weeks to obtain cicatrization of the lesions may render possible active proliferations in the zones insufficiently irradiated; the action of X-rays may be utilized to obviate such an event. The dose given in depth is 80 per cent. of the skin dose, and is given in six short applications totalling not more than 90 minutes. The treatment with radium

may be resumed after four to five weeks, if local conditions permit. These 100 cases were not selected.

On primary sarcoma and endothelioma of the vagina in adults. A young woman of 21, married two years, no pregnancy, entered the clinic 18 April, 1923, complaining of polyuria, intense pain on micturition; sanious, fetid discharge from the genitals; continued pain in the lower abdomen and in the sacral region. These symptoms had lasted six months; a large hæmorrhage, of vaginal origin, had occurred four months ago.

The inguinal lymphatic glands, which varied in size from that of a pea to a small nut, were hard and indolent. Vesical tenesmus was present; the urine was turbid and free from albumin; and some white and red blood cells were found in the sediment. There was a sanious fetid discharge and a nodular necrotic easily bleeding swelling was implanted on a large base on the posterior wall immediately within the vaginal orifice. There was also infiltration in the recto-vaginal septum.

On account of the advanced development of the neoplasm, and the participation of the neighbouring lymphatic glands in the neoplastic process, the patient was subjected to a series of Röntgen irradiations. The irradiation was well borne, no local or general disturbance of patient during or after treatment. After a few days pain ceased, bladder disturbances lessened, discharges less abundant, almost completely deprived of fætor. After a week the condition of the patient had continued to improve, but the neoplasm had not altered. Arsenic was prescribed for the patient to use at her home.

Examination of the patient one month after leaving the clinic showed general condition excellent, locally *the swelling and infiltration had completely disappeared* and in its place was a hard fibrous superficially smooth surface, neither painful nor bleeding; *the inguinal lymphatic glands were clearly reduced.* The last news of the patient, in February, 1924, was that she remained cured.

A new hypothesis on the cause of menstruation. Carlini considers that there is an analogy between the phenomena of menstruation and those of anaphylaxis. The anaphylactic crisis which initiates menstruation also initiates retrogressive changes in the corpus luteum. The modification of the uterine mucosa and the other factors contemporaneous with maturation of the ovum—the primary utero-ovarian wave of Stapfer—are produced by a second anaphylactic crisis of less intensity, due to the re-absorption of the polar body extruded by the mature ovum.

These conclusions throw a new light on the pathogenesis of many menorrhagias and metrorrhagias and suggest new therapeutic measures based on antianaphylactic methods. J. R. FORREST.

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(Special Number in honour of the 70th birthday of Professor Max Hofmeier.)

*Relationship between myomata and cardiac lesions. G. Winter.

*Prolapse of the arm and its treatment. O. v. Franqué.

*Voluptuous sensation and the related nerve endings. M. v. Frey.
Changes in the human liver after extirpation of the spleen. M. B. Schmidt.
The treatment of carcinoma of the breast. F. König.
*Relationship of the blood to the female reproductive organs. P. Morawitz.
*The effect of pregnancy on a pharyngeal tumour. P. Manasse.
*Pharmacological investigations on the excised human uterus. F. Flury.
The treatment of gonorrhœa of the uterus with bougies and celluloid capsules. R. Mutschler.
The origin of uric acid infarctions in the new-born. H. Rietschel.
Semmelweis. G. Sticker.
Polydactylism. G. Burckhard.
*The simultaneous occurrence of carcinoma in the uterus and the ovary. G. Burckhard.
Investigations on the cyclic changes in the human breast during reproductive life. O. Polano.
*Squamous-celled carcinoma of the corpus uteri. W. Schmitt.
An early ovarian pregnancy. H. Krause.
A review of the work of the maternity department of the Wurzburg University Frauenklinik from 1st January, 1889, to 30th March, 1923. H. Schimmel.
Sarcoma of the vulva. R. Veit.
The late results of the conservative and radical operation in chronic inflammatory lesions of the adnexa. H. R. Schmidt.
Contributions to the biology of the cervix. G. Dietl.
Can a reliable temporary amenorrhœa be produced by X-rays? C. J. Gauss.
The development of the ligamentum uteri teres and the region of the groin in women. W. Lubosch.

Relationship between myomata and cardiac lesions. The author reviews the above subject in both its anatomical and clinical aspect. While clinicians have been so convinced of an essential relationship between those two conditions as to talk about " myoma heart," the pathological reports have given little ground for such a name The description of " myoma heart " has in many cases been made by gynæcologists without either confirmation by physicians, or direct cardiographic evidence. Valvular lesions resulting from recent acute, recurrent, or chronic endocarditis, occur in less than 1 per cent. of cases, and are certainly attributable to some cause other than the fibromyoma. Alterations in the myocardium, such as lipomatosis, myocarditis, myofibrosis, brown atrophy, and fatty degeneration, may be explained on other grounds. The lipomatosis occurs in cases where, as a result of bleeding, pain, or other disturbing symptoms, the patients have been forced to a condition of inactivity, or where at the menopause there is in any case a tendency to fatty change. Myocarditis is more likely to be due to an intercurrent infection, or an arterio-sclerosis, than to the influence of the myoma. Myofibrosis is more likely due to circulatory disturbance, and is not specially associated with very large or with calcareous myomata. Brown atrophy is fairly common and has been regarded as the cause of sudden deaths occurring in such patients : it is found chiefly in women who are very anæmic, or where the large size of the tumour has interfered with

nutrition. It is an expression of malnutrition and is in no sense specific. Fatty degeneration occurs in the cases in which there has been prolonged bleeding. Dilatation of the heart is generally found in patients who have had a lot of bleeding, and may be considered as due to anæmia. There are a few cases in which dilatation occurs without a history of bleeding, and there are also cases in which subjective cardiac symptoms occur without there being any evident organic change. In those latter cases the symptoms resemble very closely those which occur in Graves' disease, and may be due to some alteration in the function of the thyroid, which is often enlarged in myomatous patients. A careful review of the many cases which have been published does not show any specific relationship between myomatous tumours of the uterus and alterations in the structure or function of the heart.

Prolapse of the arm and its treatment. The author describes a case in which a woman, pregnant for the fifth time, was sent into hospital with an arm in the vagina and the head in the pelvic brim. There had been no difficulty with the four previous births: the membranes ruptured seven days before labour pains set in, and the patient had continued at her household work. The interest in the treatment of the case is that the arm could not be replaced even under an anæsthetic until the patient had been placed in the Sim's left lateral position. Thereafter the woman was easily delivered by Kristeller's method: the head was born with the sagittal suture still in the transverse diameter of the outlet, owing to the arm having again passed into the pelvis and prevented rotation. As the pelvis was of normal size, the uterine wall healthy, and the abdominal wall firm, the only ascertainable reason for the original descent of the arm in this case was the possible displacement of the child's head produced by the mother's movements after the membranes had ruptured. The arm in the vagina not only prevented the descent of the head, but also prevented its normal rotation afterwards.

Voluptuous sensation and the related nerve endings. As the result of a series of investigations, conducted by means of Faradic and mechanical stimulation of the mucous membrane and skin of the reproductive organs, the author concludes that the above sensations do not depend upon the so-called genital corpuscles or special superficial nerve terminations, but upon some form of nerve ending lying more deeply in the tissues.

Relationship of the blood to the female reproductive organs. There is considerable evidence of a close relationship between the reproductive organs in women and alterations in the blood. Chlorosis is a disease practically peculiar to women: how far is it related to hypo-function of the ovary? Occasionally in pregnancy there occur typical cases of pernicious anæmia, the blood picture in every way characteristic: these cases, however, clear up completely at the end of pregnancy. Even more interesting are the three cases described specially by the author of hæmorrhagic diathesis associated with vaginal hæmorrhage, and also bleeding from the nose and mouth. In two of the three, the purpura was of the thrombopenic type, characterized by great diminution of the blood platelets. The disease was here of a temporary character, manifesting itself chiefly in the pre-menstrual

phase of the monthly cycle, and recovered from almost spontaneously. In the author's third case there were recurrent attacks of cutaneous purpuric lesions, chiefly in the pre-menstrual phase, but without any bleeding from the mucous membrane. Here the purpura was of the athrombopenic type, characterized by a normal number of blood platelets. In those cases the author believes that there is not only the usual interference with the endothelium of the vessels found in purpura, but also a disturbance of the blood-forming tissue in the bone marrow. These disturbances he believes to be due to hormones, and particularly to the influence of the corpus luteum in its phase of greatest activity, *i.e.*, in the pre-menstrual epoch.

The effect of pregnancy on a pharyngeal tumour. The author describes an angiomatous papillary fibroma growing from the pharynx, which gave rise to severe bleeding during pregnancy. The structure of the tumour indicated one of long duration, though it had never manifested itself by any symptoms before the occurrence of pregnancy. Of interest also is the fact that there was a family history of a tendency to bleeding. When the tumour was eventually excised, it was found to be very vascular with most extensive thrombus formation throughout.

Pharmacological investigations on the excised human uterus. The author deals not so much with the effect of various drugs on excised uterine tissue as with the type of uterine tissue which is most suitable for such experiments. He excludes as of little value tissue obtained from a uterus after the menopause, or from one which is either the seat of a carcinomatous or myomatous lesion. The most suitable tissue is that obtained from a regularly menstruating uterus.

The simultaneous occurrence of carcinoma in the uterus and ovary. The author gives a most exhaustive review of the opinions current in literature regarding the relationship of simultaneous malignant ovarian and uterine tumours. They hardly ever occur as independent lesions, and the balance of opinion is that the uterine lesion is more commonly secondary to the ovarian. The author describes most convincingly a case in which the ovarian lesion was undoubtedly secondary to the malignant lesion in the wall of the uterus. Having considered the anatomy of the lymphatic vessels of the reproductive organs most carefully, he thinks that in this case the metastatic transference must have taken place through the blood stream.

Squamous-celled carcinoma of the corpus uteri. The author describes a case of a woman aged 71 in which there was present a squamous-celled malignant lesion in the body of the uterus, in the vagina, and in the vulva. He found that the whole cavity of the uterus was lined with many-layered, atypical squamous epithelium. In one portion of the body there was a malignant growth of a squamous-celled type limited to the superficial layer, with a definite margin of non-malignant flattened epithelium between the new growth and the muscular wall. He was unable to say from his investigation whether the vaginal, the vulval, or the uterine lesion was primary.

JAMES HENDRY.

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Vol. lxvii, No. 5, *October*, 1924.

*Dilatation of the reproductive organs and of the ureter in pregnancy. H. Sellheim.

*The terminal loss of weight in pregnancy. R. Hirsch.

*Hegar's sign of pregnancy (the " late sign "). R. Joachimovits.

*Retention of the dead fœtus in the uterus. M. Karlin.

*Prolapse of the normally situated placenta. Larisch.

*Intravenous injection of urotropine in the treatment of retention of urine. F. Sieber.

*Treatment of puerperal fever by solutions of copper and silver. G. Scholten.

*Has the position of the placenta in tubal pregnancy any influence on the treatment? M. Beckmann.

*A rarely considered type of vaginal cyst. (Traumatic epithelial cysts.) E. Stübler.

*Pre-operative X-ray and radium treatment of uterine carcinoma. A. Mayer.

Vol. lxvii, No. 6, *November*, 1924.

*Essential (idiopathic or constitutional) dyspareunia. H. Edelberg and J. Susmann Galant.

*Observations on pregnancy after nephrectomy. R. Borelius.

*Pulmonary tuberculosis and pregnancy. (Collected references.) Bianca Bienenfeld.

*The relation of cystic changes in the ovaries to vesicular mole and chorion-epithelioma. H. Küstner.

*On the idea of so-called " justifiable mortality " in gynæcological operations, with special reference to operations for carcinoma of the uterus. K. Neuwirth.

The doctor's right to notify. Bähr.

Vol. lxviii, No. 1, *December*, 1924.

*Sex ratios and war. A. Bayer.

*Routine suture of the perinæum after labour. H. Offergeld.

A psychosis due to meningitis arising during an inflammatory disease of the genital organs. G. H. Schneider.

*The sedimentation rate of the red corpuscles and the course of cancer of the uterus. E. Eick.

*Damage to the fœtus by X-rays. H. Naujoks.

Vol. lxviii, Nos. 2-3, *January*, 1925.

*Bitemporal hemianopia in pregnancy. K. Stargardt and E. Schall.

Sellheim's wrong application of Gauss' principle of minimum force in the explanation of the mechanism of labour. D. Pulvermacher.

Minimum force in general and in the mathematical sense in particular. H. Sellheim.

*A successful case of hebotomy with the introduction of an autogenous bone graft. W. Th. Schmidt.

*Sectio Cæsarea vaginalis vera. N. Kakuschkin.

*Forceps in a breech presentation. N. Mansbach.

*X-ray and radium treatment of malignant tumours in gynæcology. H. Kupferberg.

*Heterotopic growths resembling the uterine mucous membrane in structure. A. Lauche.

*Heterotopic endometroid proliferations in the female genital tract, as reported in the Anglo-American literature. A. Haeuber.

*Experimental and clinical experiences with humanol in the prevention of post-operative adhesions. P. Kraeuter.

*Cancer problems and experimental cancer research. G. Döderlein.

*X-rays and radium in gynæcology in 1923. C. H. Engelbrecht.

Dilatation of the reproductive organs and of the ureters in pregnancy. Sellheim discusses the mechanisms, such as diminution of tone, expansion and hypertrophy, causing the distension of the uterus and vagina during pregnancy and labour, and compares them with the distension of the ureters due to the increase in the quantity of urine in pregnancy.

The terminal loss of weight in pregnancy. Hirsch found an average loss of weight in the last 4-6 days of pregnancy in 170 cases, but a large individual variation; he attributes it, together with the onset of labour, to the action of the pituitary gland.

Hegar's sign of pregnancy. A complete " late " Hegar's sign was found in two and a partial one in eleven of fifty abortions on the fifth day after complete evacuation of the uterus. The sign lasted for a variable time, thus throwing some doubt on the usual explanation of its origin. It is probably due to histological changes.

Retention of the dead fœtus in the uterus. After the death of the fœtus the vessels of the placental papillæ collapse and retrogressive changes and necrosis occur where the circulation is insufficient. Some papillæ continue their growth, however, and even fresh ones may be formed. Hypertrophy of the syncytium with surrounding vacuolisation or fibrous changes in the stroma may occur, and some changes may be suggestive of syphilis.

Prolapse of the normally situated placenta. This serious complication may be due to gross mechanical injury, or to local pathological conditions, such as hydramnios or endometritis, or to general conditions such as nephritis. In the reported case, mechanical injury may have been caused by a severe persistent cough for some days before delivery.

Intravenous injection of urotropine in the treatment of retention of urine. Sieber's results were as follows :—

(1) Intravenous injection of urotropine is a fairly reliable treatment for retention of urine, giving good results in 85 per cent. of cases.

(2) It generally failed after Wertheim's hysterectomy.

(3) It is best not to give more than 5 cc. of the 40 per cent. solution, in order to avoid toxic manifestations, which may amount to hæmaturia.

(4) It should be given cautiously in pregnancy as large doses have caused the onset of pains.

Treatment of puerperal fever by solutions of copper and silver. Colloidal kupro-kollargol has given good results in slight and moderately severe cases of puerperal sepsis, especially when used at once, but it failed in generalised pyæmia. It has no bad effects. As the preparation may be assumed to stimulate the general cell activities, including the protective processes, Scholten recommends its prophylactic use in pregnancy and

labour, wherever there is any suspicion of infection. It should be accompanied by general measures.

Has the position of the placenta in tubal pregnancy any influence on treatment? Beckman considers the duration of extrauterine pregnancies with different positions of the placenta, and concludes that a basal site in the tube, though the rarest, causes the earliest interruption of pregnancy. Other factors are the distance from the peritoneum, and the distensibility of the tube.

A rarely considered type of vaginal cyst. After summarizing other forms of vaginal cyst, Stübler describes a common form of small, often multiple cysts, which occur on the position of an old perineal tear or colporrhaphy wound. He believes they are developed from displaced epithelial cells.

Pre-operative X-rays and radium treatment of uterine carcinoma. The result of operative treatment can be improved by previous X-ray or radium treatment, especially when the growth is septic and sloughing. The later results also are better, if operation is performed after a suitable interval of about six weeks, when shrinkage and disinfection have taken place, and any residual cancerous tissue can be removed. There may be differences in the hardening effects on the tissue of X-rays and radium.

Essential (idiopathic or constitutional) dyspareunia. Edelberg and Galant sum up their consideration of dyspareunia as follows:—

(1) Kehrer's theory of the intimate connexion between dyspareunia and sterility and the formation of myomata and cysts requires further confirmation.

(2) Rohleder's definition of dyspareunia, as failure of the female orgasm at the moment of ejaculation, is too narrow to be of value.

(3) Temporary dyspareunia at the beginning of sexual life is physiological.

(4) Essential dyspareunia consists of a high degree of indifference in women of normal, general and sexual development, and normal sexual sensibiltiy. It is an inhibited development of libido. The patients have neither desire nor orgasm during intercourse, though they may derive pleasure from embraces at other times.

(5) Acquired dyspareunia may follow sexual perversions or excesses, unhygienic interrupted intercourse or psychic inhibitions.

(6) Treatment should be directed to suitable psychotherapy and general tonic treatment which is harmless and suggestive.

(7) Galant calls the vaginismus which may be defensively developed in these cases dyspareunic vaginismus.

Observations on pregnancy after nephrectomy. Normal pregnancy can follow nephrectomy without any difficulty where the other kidney is normal and can hypertrophy. The question is more complicated where the second kidney is affected, as by tuberculosis, and it may be necessary to avoid pregnancy in these cases, and to induce labour on the occurrence of symptoms.

Pulmonary tuberculosis and pregnancy. It is well known that pregnancy has a deleterious effect on a phthisical patient and that the children often

die young. The latter is probably due to exposure to infection rather than an inherited tendency to the disease. One group of observers believe induction to be unnecessary, but more consider it justifiable in the maternal interest. It is important to choose the time of induction carefully; it is best performed whenever a latent pulmonary lesion becomes active, a point which may be partially determined by cutaneous reactions.

As regards prognosis, the pathological anatomy is important. Healed or latent cases do well; 60 per cent. of cases of caseous tubercle die, while cases of pulmonary tuberculosis developing during pregnancy do worst of all. The method of spread also affects the prognosis. The bronchial type may do well during pregnancy, when the abdominal distension acts somewhat like a pneumothorax, only to progress rapidly after delivery, when the sudden emptying of the uterus acts as an aspirator to spread the infection. Evidence of extension by the blood stream is an indication for induction, but where the spread is by the lymphatics the pregnancy can generally continue safely.

Some cases of artificial pneumothorax have been observed, but the results are not satisfactory.

Induction reduces the later mortality considerably, and supravaginal hysterectomy appears to be more satisfactory than a mere emptying of the uterus.

The relation of cystic changes in the ovaries to vesicular mole and chorionepithelioma. Five cases of chorionepithelioma are described in detail by Küstner, who reaches the following conclusions:—

(1) At the time of formation of a vesicular mole, changes occur in the ovaries, leading to cystic degeneration and marked proliferation of the lutein cells.

(2) After the expulsion of the mole these changes rapidly retrogress and normal ovulation soon re-occurs.

(3) The lutein cysts which are occasionally found in cases of chorionepithelioma are presumably residues of the condition which accompanied a previous vesicular mole.

A direct influence of the chorionepithelioma on the ovaries is unlikely, as chorionepithelioma does not belong to the changes caused by pregnancy, but to the malignant neoplasms.

On the idea of so-called "justifiable mortality" in gynæcological operations, with special reference to operations for carcinoma of the uterus. Neuwirth strongly deprecates operation for uterine cancer. In view of the possible mortality he does not consider it justifiable to operate, where, as he believes, equally good results can be obtained by radium.

Sex ratios and war. Bayer endeavours to account for the increased proportion of males over females born towards the end of, and just after, the late war. He considers as possible factors differences in town and country life, parity and epidemics of disease, including venereal disease, and discusses Hartmann's theory that the smaller number of births threw less strain on the woman and so diminished the number of miscarriages, which he believes to be more common with the male than the female fœtus. However, the statistics do not support any of these theories, and Bayer believes that under-nutrition was an important cause, acting on either the

father or mother or both. Possibly the chromosome bearing the male factor is less easily harmed than that carrying the female factor.

Routine suture of the perineum after labour. Offergeld considers that perineal tears only represent a small proportion of the damage occurring during labour, and strongly advocates the routine use of sutures immediately after labour, even when the skin is still intact. He believes this counteracts the slackness of the tissues, and so prevents post-natal complications.

The sedimentation rate of the red corpuscles and the course of cancer of the uterus. The following conclusions are reached :—

(1) The sedimentation rate may be quite normal in cases of inoperable uterine carcinoma.

(2) The sedimentation rate is of no use in distinguishing operable from inoperable cases.

(3) One estimation is of no prognostic value, but a series of values shows a rise or fall parallel to the clinical course of the disease, whether improving or extending.

Damage to the fœtus by X-rays. Naujoks reports a case of microcephaly occurring after the mother had received several X-ray exposures for sarcoma of the ovary in the early months of pregnancy. Several other cases have been reported, and X-ray treatment should be avoided in pregnancy.

Bitemporal hemianopia in pregnancy. Stargardt and Schall find no evidence in the least in support of Löhlein's account of a bitemporal hemianopia in pregnancy, and show on anatomical grounds that a larger increase in size in the pituitary would be required to cause pressure on the chiasma than is found in pregnancy.

A successful case of hebotomy with the introduction of an autogenous bone graft. A hebotomy was performed after forceps had failed to extract the child in the case of a primipara, aged 26, with a true conjugate of 7 cm. After the pubis had been divided, 1.5 cm. from the midline, the child (wt. $6\frac{3}{4}$ lbs.) was delivered alive with forceps. A piece of bone, 3.5×1 cm., was then removed from the pubic ramus and introduced into the split. After a prolonged convalescence, during which sequestra were discharged for some time, the patient became pregnant again, and was delivered after $3\frac{1}{2}$ hours' labour of an 8 lbs. child without any difficulty.

Sectio Cæsarea vaginalis vera. Kakuschkin describes his method of performing vaginal Cæsarean section which consists in opening the anterior fornix and incising the anterior surface of the uterus above the cervix, which is left untouched. He claims that this technique has the advantages of rendering the field of operation more easily visible, and of injuring the uterus less than Dührssen's method.

Forceps in a breech presentation. Forceps were applied as a last resource to a large child (4.7 kilos.) with a breech presentation, and delivery of a living child effected with a breech hook.

X-ray and radium treatment of malignant tumours in gynæcology. Kupferberg gives a detailed account of the method of treatment he has adopted after ten years' experience of uterine carcinoma. He considers diagnostic excision, curetting or cauterization likely to cause irritation and spread of tumour cells, except where total wedge excision or curetting the cavity of the uterus can be performed. In operable cases he starts with X-ray treatment of smaller dosage than usual, immediately followed by radium. Three to six weeks later, when the tumour is smaller and less infected, he performs a total vaginal hysterectomy under parasacral or lumbar anæsthesia. He follows his cases up with X-ray and radium treatments—three in the first year, two in the second, and one in the third, fourth and fifth years after operation.

Inoperable cases have the same course of treatment without the hysterectomy. Forty per cent. of cases remained cured five years later, where the full course had been given.

Heterotopic growths resembling the uterine mucous membrane in structure. Lauche's chief points in summing up the present state of knowledge of these scattered growths of common endometrial structure and function are:

(1) Their varying etiology, *i.e.*, (i) regeneration; (ii) hyperplasia; (iii) metaplasia (doubtful); (iv) transplantation; (v) failure of differentiation during development; (vi) formation of blastomata.

(2) Their similar method of spread, generally by transplantation as in the peritoneal growths following tarry cysts of the ovary.

Heterotopic endometrial proliferations in the female genital tract as reported in the Anglo-American literature. Haeuber has collected English and American references on this subject, largely from the work of Sampson; he mentions the latter's views on implantation, after operation or obstructed menstrual flow, as the mode of origin of the adenomata, their association with ovarian hæmatomata, the stimulating action of the ovary on their growth, and conversely the regression of extra-genital adenomata after bilateral ovariectomy.

Experimental and clinical experiences with humanol in the prevention of post-operative adhesions. Kraeuter experimented on rabbits. He first showed the inevitable formation of adhesions after baring a small area on the descending colon, and then in a second series he introduced humanol (human fats) or rabbit fat into the peritoneal cavity, when a second laparotomy, undertaken after a variable interval (five days to four months), showed good results, the fat covering the raw area until healing was complete. The method failed (i) where too large an area was left, as this took longer to heal, and (ii) also where infection was artificially introduced. Clinically Kraeuter has found humanol useful in relieving the symptoms of 37 out of 42 cases operated on for adhesions.

Cancer problems and experimental cancer research. Döderlein has succeeded in producing carcinoma in mice by prolonged painting with tar. He has taken as criteria of true carcinoma (*a*) irreversible growth, and (*b*) destructive growth into the deep tissues—not necessarily the formation of metastases or transplantibility. He used tar, or tar and raw paraffin oil, but found the latter was too irritating and caused much ulceration and often death. The necessary properties of the tar were (*a*) power to dissolve

lipoids, and so affect the cell surface tension, and (*b*) to produce inflammation.

The processes produced by the applications were as follows :—

(1) An acute dermatitis, which sometimes went on to ulceration, healing when the tar was discontinued.

(2) In four to six weeks a localized thickening of the skin occurred in all cases. The epithelium showed simple hyperplasia, while the connective tissue showed abundant areas of inflammatory infiltration surrounded by increased elastic tissue.

(3) In eight to ten weeks some cases showed warts—benign papillomata with no suggestion of malignancy. The connective tissue showed scarring.

(4) With diminution in the elastic tissue, malignant changes supervened leading to infiltration of the deeper tissues.

During the latter stages, the proportion of potassium and calcium in the connective tissue and epithelium was reversed, more calcium than potassium being found in the epithelium.

Potential malignancy is present in the tumours before any sign is detectable microscopically, as shown by Murray and Woglom, who were able to produce cancer from transplantation of the benign papillomata without any further tar treatment.

In cases where the animals were scratched or bitten early in the treatment, the resultant epithelial proliferation was excessive, a point which suggests that curetting or excision of growths clinically may lead to extension.

X-rays and radium in gynæcology in 1923. Only a few points from this extensive summary can be reproduced here. One of the most frequent is the question of dosage, which has not been definitely standardized, and which accounts for the variability of the results reported, and possibly for the occasional local ill effects.

The treatment has been used for carcinoma of the genital tract and the mammæ (the latter with less success), in peritonitis, pelvic and general, pruritus, and in order to produce castration in myoma of the uterus, osteomalacia, and cancer of the breast.

As regards the mode of action, emphasis is laid on the general effect as well as the local one on the tumour cells and the surrounding connective tissues. The sickness which sometimes follows the treatment is probably of reflex nervous origin.

Finally, the importance is brought out of proper preparation and investigation before, and general and local care after treatment in each case.

DOROTHY N. L. LEVERKUS.

Acta Gynecologica Scandinavica.

Vol. iii, Fasc. 3.

*A clinical study of tuberculous salpingo-oöphoritis. P. Wetterdal.

*Operations on some cases of fibromyoma unsuccessfully treated with X-rays. P. Hempel-Jörgensen.

*Results of the treatment of placenta prævia in the obstetrical department of the General Hospital at Malmö. G. Bauer.

Supplement. Supernumerary mammæ in the axilla. A clinical and anatomical investigation. J. Horn.

A clinical study of tuberculous salpingo-oophoritis. The material consisted of 56 cases treated at the Sabbatsberg Hospital, Stockholm, during the years 1914-23. They formed 14.5 per cent. of all cases operated on for adnexal inflammation. During the first half of the time, when there was no routine examination of all extirpated tubes, only ten cases were diagnosed; while in the latter half of the time, when this examination was systematically carried out, the number of cases recognized amounted to 46. The author concludes, therefore, that statements regarding the frequency of tuberculosis are worthless, unless all appendages removed have been microscopically examined.

Stress is placed on the frequent occurrence of adhesions, which rendered difficult or impossible a radical operation. Secondary septic infection was a common and dangerous complication. Intestinal fistulæ were present before the operation in ten cases.

A reliable diagnosis of adnexal tuberculosis cannot be pronounced before operation, except in a few cases. Pathognomonic features are: (1) Diseased appendages associated with ascites; (2) Nodules felt in the pouch of Douglas; (3) Recognition of tuberculosis by microscopic examination of material removed by curettage of the uterus, or obtained from the cervix or from sinuses; (4) Positive result of inoculation test of guinea-pig with pus.

The following justify the suspicion of tuberculosis:—(1) The occurrence of adnexal disease in virgins; (2) The presence of tuberculous disease in the lungs or elsewhere; (3) A low state of the general health, with loss of weight and low hæmoglobin value; (4) Pyrexia lasting more than two months; (5) Well-marked signs associated with slight symptoms; (6) Extension of induration while the patient is remaining in bed.

At the operation, the clearest sign is the presence of tuberculous granulations. A patent abdominal ostium was found in 50 per cent. of tuberculous tubes, but in only 10 per cent. of the non-tuberculous. Inspissated pus resembling caseous material is often found in non-tuberculous salpingitis and it is therefore not characteristic.

Operations on some cases of fibromyoma unsuccessfully treated with X-rays. In three out of five, myomata were present in a submucous situation. The views of a large number of writers are quoted, and the majority regard such a condition as a contraindication to treatment with radiations.

Results of the treatment of placenta prævia in the obstetrical department of the General Hospital at Malmo. During twenty years, 185 cases have been treated, being almost exactly one per cent. of the total deliveries. Central placenta prævia was diagnosed in 41. Post-partum hæmorrhage called for special treatment in 33 and it was of a very severe nature in nine. Puerperal fever occurred in 58. The number of maternal deaths was four, giving the extremely low rate of 2.2 per cent., but it is evident that many slight cases are included. The fœtal death-rate was 45 per cent., or 39 per cent. after correcting for premature children.

In 34 cases the bleeding was very slight, and no special measures were adopted. In 79 cases (lateral placenta prævia with head presentation) the membranes were ruptured and, generally, 0.5 cc. of pituitrin given. In 53 cases either version or bringing down a foot was the treatment. Metreurysis, packing, delivery with forceps, and Cæsarean section were employed a few times only.

A. GOUGH.

Medical Science: Abstracts and Reviews.

MEDICAL SCIENCE: ABSTRACTS AND REVIEWS. The following abstracts are reprinted from "Medical Science: Abstracts and Reviews," by kind permission of the Medical Research Council:—

Some effects of unilateral ovariotomy in rabbits. Asdell, S. A. *Brit. J. Exper. Biol.*, 1924, 1, 473-86. Abstracted from "Medical Science: Abstracts and Reviews," 1924, xi, 2, 94.

This paper describes a series of experiments in which a number of rabbits were partly ovariotomized, the quantity of ovarian material removed being from one-half to five-sixths of the total present. These operations were performed before puberty. On breeding, the size of the litter was found to be smaller than that of control rabbits living under the same conditions. The number of eggs shed by the operated rabbits was but little different from that shed by the controls, suggesting that the basis of fecundity is to be found in somatic conditions rather than in the quantity of oöcytic material present. Hypertrophy of the remaining ovarian tissue occurs to a varying degree and is proportionately the greater as more ovarian material is removed. No hypertrophy of the interstitial material could be detected. H. GARDINER HILL.

Congenital hypogonadism. M. S. Reuben and G. R. Manning. *Arch. Pediat.*, 1924, 41, 489-98. Abstracted from "Medical Science: Abstracts and Reviews," 1924, xi, 2, 96.

In this contribution the authors describe a series of seven cases of congenital hypogonadism, the symptoms varying in intensity and depending on the degree of testicular deficiency. The clinical picture is similar to that seen in young castrates, and in cases where the testes are congenitally absent. This group of cases must be particularly distinguished from Fröhlich's syndrome, where hypogonadism is also a characteristic feature.

In the summary of the authors' personal cases, the children are described as being over-sized and over-weight for age; the genitals are undeveloped; there are no signs of the secondary sexual characteristics. The mentality is normal in all. The part of the body below the umbilicus is larger in proportion to the total length than in normal children. The thymus was persistent in several cases; the pituitary was normal or slightly enlarged. They all presented contours of a feminine type, associated with general adiposity. The X-ray of wrists showed delayed ossification, the basal metabolism in two cases was subnormal and the sugar tolerance in two cases was normal. Photographs of all these cases are provided. A review of our present knowledge of the function of the testicles is also included in this paper, and the influence of their internal secretion upon growth and metabolism is discussed. H. GARDINER HILL.

REPORTS OF SOCIETIES.

THE ROYAL SOCIETY OF MEDICINE.

Section of Obstetrics and Gynæcology.

Meeting held December 4th, the President in the chair.

Mr. Sydney Forsdike showed a specimen of Vesical calculus formed round a foreign body.

The specimen was a phosphatic stone, oval in shape, weight in the recent state three ounces, $4\frac{1}{2}$ inches long, $5\frac{1}{4}$ inches in circumference and enclosing a bone penholder minus the metal fitting. The patient was a single girl, aged seventeen, had missed two periods in May and June. Soon afterwards in July a penholder disappeared and was not recovered; the patient, of dull intelligence, thought nothing more of it. In August she began to have frequency of micturition which rapidly became worse until September 8, when she was quite unable to hold her water and was brought to out-patients. A hard lump was felt above the pubes, which on bi-manual examination proved to be in the bladder. The urine contained a large quantity of pus but no blood. X-ray examination showed a large calculus surrounding a long foreign body.

Suprapubic cystotomy was done and upon attempting to lift the stone out it was found to be fixed. Close examination showed the head of the holder was buried in the right wall of the bladder and removal intact would have entailed tearing the bladder wall or perforating it. The head of the holder was then cut off with a bone forcep, leaving it *in situ*, thus freeing the stone and allowing it to be easily removed. The head was then removed with some little difficulty leaving a small round ulcer which had almost perforated. The bladder was drained and the patient recovered after a prolonged illness.

The specimen was discussed by the President.

Dr. Arthur Crook, of Norwich, read a paper on the

Incidence of glycosuria during pregnancy.

The number of cases of unselected pregnancies dealt with was 548, yielding 1,346 urinary examinations. The cases included 26 with complications. Incidence of sugar of 548 patients, 166 had glycosuria at some time of pregnancy (30 per cent.), 23 had glycosuria in more than one pregnancy, but not all (4 per cent.), eight had glycosuria in all their recorded pregnancies (1.5 per cent.). Of the 166 detections of sugar, 40 were first noted before the 21st week; 126 first noted after the 21st week; the highest number being at the 28th week, the next two highest at the 22nd and 30th weeks. Percentage of cases losing the glycosuria before labour in those who had sugar before the 21st week was 59 per cent., and it was 32 per cent. in those who developed the sugar after the 21st week. The cases in which sugar was detected before the 21st week had no recorded signs of toxæmia, but those

signs were reported more often in those who developed the sugar after the 21st week. No special incidence of septic infection was recorded. The average weight of the children was 7.2 lb. The sugar was absent from the fasting urine in most of the cases and was amenable to diet.

Cases were related: (1) showing the occurrence of œdema of legs, pruritus and hydramnios in both pregnancies associated with glycosuria; (2) a case in which large quantities of sugar were present (up to 400 grs. per diem), and were also present in the fasting urine, and which did not disappear from the urine till six weeks after labour (premature), and in which the blood sugar index three hours after a glucose meal was 18. Her highest blood sugar, during pregnancy, was .136 after glucose. (3) A case showing in three successive pregnancies the association of glycosuria and albuminuria with pernicious vomiting. (4) A case illustrating the ante-natal death of the nearly mature fœtus in glycosuria and hydramnios. Two cases of true renal diabetes associated with pregnancy had no abnormal symptoms or signs.

The large majority of cases in which sugar is found in the urine during pregnancy are unimportant; this applies especially to those occurring in the period before the termination of the fourth month, and those appearing at the end of pregnancy. There are a group of cases mostly found at about the fifth month, which are more difficult in regard to prognosis; they frequently have had severe vomiting and are associated with œdema of legs and hydramnios, and the fœtus may die when nearly mature, before labour.

The paper was discussed by the PRESIDENT, who congratulated Dr. Crook on his record of clinical observations carried on over a period of 16 years. There was at present a good deal of uncertainty and vagueness about the proper class into which to put some cases of glycosuria in pregnancy, in spite of much recent work on the subject, and the after-histories recorded by Dr. Crook were of value in helping to show the relation of continued glycosuria to diabetes. His own experience was that pregnancy in real diabetes was rare, and that in most cases of glycosuria in pregnancy the patient's health was not affected and no special treatment was necessary.

Dr. KNYVETT GORDON, speaking from the point of view of the pathologist, said that very many pregnant women suffered from glycosuria at one time or another during pregnancy, the proportion being in his experience somewhat over 50 per cent. The great majority of these had no other symptoms and required no specific dietary or medicinal treatment. The same thing happened in regard to the output of urea. If the urea content of the blood in normal pregnancy is estimated, it is found as a rule to be lower than the normal, and the same phenomenon occurs with regard to the glucose content of the blood. So both in regard to protein and carbohydrate, these occur less in the blood and more in the urine than in non-pregnant women, or as the physiologist would put it, the kidney threshold for both urea and glucose is lowered.

The explanation in his view lay in the hypothesis that owing to the increased stimulation of the kidneys, probably of an endocrine nature, they became more active during pregnancy. If this stimulus failed the patient was in danger of toxæmia or even eclampsia. In the bulk of the cases cited by Dr. Crook, the blood sugar had not been estimated, so it was difficult to say whether they were toxæmic or not. The most useful remedy for metabolic disturbances in pregnancy, whether in regard to protein or carbohydrate, was thyroid extract.

Dr. EVERARD WILLIAMS raised the question of the innocence of cases of glycosuria without hyperglycæmia in pregnancy. Further knowledge and experience of cases of renal glycosuria or *diabetes innocens*, had shown that some of these subsequently developed into true diabetes. It would be well to bear in mind the possibility that at any rate some of these cases may be early cases of renal glycosuria, made manifest by the strain of pregnancy, as had been suggested by another speaker (Dr. Barris) in cases of so-called alimentary glycosuria.

Dr. PILLMAN WILLIAMS, Dr. LOGAN, Dr. BOURNE and Dr. BARRIS also discussed the paper.

Prof. LOUISE McILROY read a paper on some

OBSERVATIONS UPON THE RELATIONSHIPS BETWEEN THE LOSS OF HEAT AND LOSS OF WEIGHT IN THE NEW-BORN.

The usual explanations that changes in metabolism of the infant when adapting itself to neonatal conditions do not seem sufficient to explain the loss of weight in all cases. A series of observations were made upon infants who were wrapped up in a warm blanket at birth, and subsequently cleansed daily with olive oil instead of soap and water. The results were very satisfactory; there was less initial loss of weight in the first three days than in the controls or bathed babies and the increase of weight was more appreciable during the rest of the child's stay in hospital. The controls were taken at the same season of the year, same birth weights to within 8 ozs.; and same number in the family. Numerous charts were shown to illustrate comparative weights in bathed and oiled babies in cases of forceps, Cæsarean section, and induction of labour deliveries. Charts of weights of babies of mothers suffering from toxæmia were also shown. Also charts of temperatures taken per rectum at birth, one to two hours after and after oiling were given and a drop of one to two degrees was found to be present in the majority of cases. Exposure to air during cleansing causes a loss of heat.

New-born babies should be kept as much as possible in one apartment with an even temperature, and bathing should be dispensed with for seven or eight days after birth. The infants are sweet and clean when oil is used as it is wiped off after the daily cleansing. In the treatment of infants suffering from shock at birth, it is found that better results are obtained by warmth and rest and the avoidance of baths or artificial respiration. The respiratory passages should be cleared of mucous by a rubber tube and stimulants given, such as pituitrin 2 minims hypodermically: or strychnine. Gentle massage of the heart is sometimes helpful.

The PRESIDENT congratulated Prof. McIlroy on her paper and remarked that papers on subjects concerning the new-born infant were too rarely brought before the section. He thought that some of the charts shown were very striking. He agreed that in cases of white asphyxia the less vigour used in attempts at resuscitation the more likely were they to be successful. He thought that the method of putting cold water on the infant's head had not been taught for many years.

Dr. KNYVETT GORDON asked what was the weight of the olive oil used for inunction; it seemed possible that the diminished loss of weight recorded in the oiled babies might be accounted for by absorption of so much oil. That absorption from the skin of new-born infants readily occurs is shown by a case in which the vagina of the mother was painted and

swabbed freely with violet green, and shortly after birth the urine of the baby was coloured with the same dye. Oily substances were as a rule more easily absorbed than watery solutions. As regards loss of heat, oil would retard and water accelerate evaporation, and consequent lowering of temperature. Some of the oil would possibly be used as a food.

Dr. CLIFFORD WHITE and Dr. BOURNE also discussed the paper.

NORTH OF ENGLAND OBSTETRICAL AND GYNÆCOLOGICAL SOCIETY.

A Meeting of the North of England Obstetrical and Gynæcological Society was held at Sheffield on Friday, November 21, 1924. The President, Prof. A. DONALD, in the chair.

Dr. K. V. BAILEY (Manchester) presented

TWO CASES IN WHICH THE UTERUS HAS RUPTURED THROUGH A PREVIOUS CÆSAREAN SECTION SCAR.

Case I. The patient, a ix-gravida, aged 42 years, with the following obstetric history: Seven full-time normal deliveries; one previous Cæsarean section for ante-partum hæmorrhage when six months pregnant. This was 18 months ago.

The patient was admitted to St. Mary's Hospital, Manchester, on May 12th, 1924. Prior to admission she had suffered vague, general abdominal pain for 18 hours. On admission there were definite signs of internal bleeding. Her general condition, however, was good and the abdomen, though somewhat tender, was soft and pliable. The child could be easily palpated through the abdominal wall and free fluid detected in the peritoneal cavity. There was no bleeding per vaginam and the cervix was closed. The uterus itself could be felt through the posterior vaginal fornix.

At operation the abdominal cavity contained a quantity of free blood and a 9½ lb. child together with cord and placenta was found to have been extruded into it through the tear in the anterior uterine wall. This was mesially situated and measured five inches and was brought about by the lower two-thirds of the previous Cæsarean scar having given way. The upper one-third of this scar could be easily seen. The child and placenta were extracted and the uterus and appendages removed by supravaginal hysterectomy. The patient made an uneventful recovery.

In this case the rupture had taken place before the onset of labour, although the patient was at full term. Presumably the uterine scar had given way on account of the gradual distension of the uterus by its contents.

Case II. The patient was a iv-gravida, aged 29 years. Obstetric history: three previous Cæsarean sections for contracted pelvis. The last was 21 months ago.

The patient had been seized with vague abdominal pains of a diffuse nature three hours before admission. On admission to St. Mary's Hospital on November 20th, 1924, the abdominal pain had largely subsided, and the patient expressed herself as "much better." There were no symptoms or signs of shock or hæmorrhage. The abdomen was full but soft and pliable. What appeared to be a ventral hernia occupied the umbilical region. This protrusion was of the consistency of intestine but was dull to percussion. The fœtal parts could be indefinitely palpated and there was

slight but definite tenderness on palpation of the abdomen. There was no evidence of free fluid in the peritoneal cavity. Per vaginam there was a thin but constant trickle of blood. The cervix was normal, and no presenting part could be felt per vaginam.

At operation the intact membranes were observed to have herniated through a mesial longitudinal rupture of the anterior uterine wall. It was these membranes—filled with liquor amnii—that had produced the appearance of a ventral hernia on inspection of the abdomen. The child was removed but failed to survive. The uterus and appendages were removed by supra-vaginal hysterectomy.

In this case the whole of the previous Cæsarean section scar had given way, presumably owing to the gradual uterine distension. This had occurred at the end of the eighth month of pregnancy.

Summary. In both cases the condition was accompanied by astonishingly few symptoms. There was no shock and relatively little bleeding in either case—a condition of affairs which might conceivably lead to a mistaken diagnosis.

Although, at St. Mary's Hospital, there is an average of 120 Cæsarean sections performed yearly, the second of these two cases is the only one of its kind that has occurred during the last 18 months. (The previous Cæsarean section referred to in the first case was not performed at St. Mary's Hospital.)

Dr. DOUGAL (Manchester) thought that an interesting point about these cases was that the rupture generally occurred very early in labour. He had only met with one case, a very early one, in his own practice, although he had performed the second or subsequent Cæsarean operation in many patients who had actually commenced in labour.

Dr. J. W. BRIDE (Manchester) reported

A CASE OF HÆMATOCOLPOS.

There are certain features of interest about this case which make it worth reporting. The patient, M. C., No. 1006, a girl of 16 years and 8 months, was admitted to hospital on July 30th, 1924, complaining of never having menstruated and of a painful abdominal swelling. She stated that she had never menstruated nor had there been any symptoms which might have corresponded to a monthly period. For the past few months, she was indefinite as to the exact time, she had noticed a swelling of the abdomen, which hurt her, and there had been pain and difficulty on micturition and defæcation. The patient was a well-developed healthy girl with no sign of tuberculosis or other general disease.

The abdominal examination showed a uniform swelling above the pubes similar in size and shape to a six months pregnancy, and which is shown in one of the photographs taken after admission. On examining the vulva it, with the perineum, was seen to be protruding considerably, and the labia majora and minora were widely separated by the bulging, tough, bluish-looking, and imperforate hymen. This is tolerably well seen in another photograph. This bulging was much increased by slight pressure on the abdominal swelling.

On August 1st, 1924, under anæsthesia, he made a small puncture in the hymen, and a thin forcible stream of dark syrupy fluid gushed out, as is seen in the third photograph. He estimated that at least three or four pints of this fluid were slowly evacuated. He refrained from any digital

examination at all at this stage on account of the risk of septic infection.

The patient did very well and she was discharged from the hospital on August 9th, 1924. Before she left he examined vaginally and found a uterus about the size of a two months pregnancy, and both tubes were considerably enlarged. He saw her again in the out-patients' department a few weeks ago. She had menstruated on September 4th for five days with no pain, and her mother considered it had been a normal period. On vaginal examination the uterus was normal in size, but there was still some enlargement of both the tubes.

He considered that this case of imperforate hymen was complicated by hæmatocolpos, hæmatometra and hæmatosalpinx.

Dr. DOUGAL (Manchester) had operated upon four of these cases. His last patient was a girl of fifteen who complained of excruciating abdominal pain. The obstructing membrane was extremely tense and bulged forward between the labia. The patient was admitted to hospital as soon as possible but unfortunately the Sister decided to give her a hot bath immediately after admission with the result that the membrane ruptured and the blood poured out into the bath. The accident had no untoward effects, however, the remains of the membrane being excised the following day after which she made a good recovery.

Dr. H. LEITH MURRAY (Liverpool) reported

A CASE OF CYST DEVELOPMENT IN AN OVARIAN GRAFT.

The case now recorded is the only one in my experience of ovarian grafting where a graft, implanted within the rectus muscle, has given rise to serious trouble. In a spirit of broad-minded enquiry, and without prejudice to my opinion of ovarian grafts, it has been my custom since January 1922, to graft a small slice of ovary in the situation named in all cases where the ovaries had to be removed, and where infection did not contraindicate such a proceeding. Altogether, to date, I have done 54 ovarian grafts. In no case has the patient known about the graft, and in only two instances apart from the present case has there been any complaint of pain at the site of grafting; neither of these was either persistent or troublesome.

My routine is to cut a slice of ovary, about $\frac{3}{16}$ to $\frac{1}{4}$ of an inch thick, from the free border towards the hylum, cystic, but not lutein, areas being avoided. The graft is placed in one or other rectus muscle towards the outer edge of its anterior surface through a tunnel bored by the finger; a mattress suture is inserted to secure the opening. This is done at the beginning of the operation, practically as soon as extirpation has been decided on.

The patient, aged 35, was unmarried, and recorded a sole confinement 19 years previously. Pelvic pain with ill health followed, and was treated, without improvement, by ventral fixation, subtotal hysterectomy, and later by appendicectomy. When I saw her first in December, 1923, there was marked vaginal prolapse with the cervix at the vulva, and in addition tender appendages fixed in the pelvis. Colporrhaphies were carried out, dense omental and appendage adhesions separated, both appendages removed, and a graft placed within the right rectus muscle. The patient experienced the greatest relief from the operation for $3\frac{1}{2}$ to 4 months, when there began to develop localized pain with swelling behind her old appendix scar.

When seen six months after her operation, a tensely cystic lump, the size of a small orange, was seen and felt bulging her appendix scar; it was very tender, fixed in the abdominal wall, and obviously lay behind the rectus muscle. Enucleation was relatively easy, although the cyst burst during removal. About two ounces of clear fluid escaped. The bed was extremely vascular, and although obliterative sutures were inserted, a hæmatoma formed which had to be exacuated and re-sutured. In view of the vascularity of the bed, it is not surprising to find that the bulk of the graft tissue appears to be growing strongly with good nuclear staining and without round-celled deposit or œdema; vascularity is good but no normal ova can be seen. The cyst wall shows no definite lining and is certainly not associated with the copious, rather degenerated lutein tissue to be seen in places. The graft had been in position 196 days when it was removed. The patient has been well ever since.

Cystic change in ovarian tissue grafted in the abdominal wall appears to be unexpectedly rare. Tuffier[1] does not record it, and Lack[2] has collected only four cases, including his own case recorded in 1924. This rarity is so remarkable that one cannot help thinking that the majority of grafts do not become vascularized from the surrounding tissue, and, therefore, speedily atrophy.

1. Tuffier. *Bull. acad. de med.*, Paris, 1921, 86, 99. (*International Abstract of Surgery*, 33, 491.)

2. Lack. *Proc. Roy. Soc. Med.* (Obst.), 17, 33.

The adjourned discussion on the PRESIDENT'S paper on the Treatment of mobile retrodisplacements was then resumed.

Miss IVENS (Liverpool) was of opinion that the majority of cases of mobile backward displacement caused trouble sooner or later, especially in women who had to stand a great deal or work hard. She had several times tried the effect of a preliminary dilatation and curettage when there was dysmenorrhœa, but the cases returned for further treatment. With regard to the passive congestion theory she was surprised that Dr. Donald had not mentioned the cystic ovary and varicocele of the broad ligament so often associated with retroversion of the uterus. Miss Ivens preferred the Mayo modification of the round ligament operation. She did not think peritoneal fixation was satisfactory, and had re-operated a considerable number of cases where the peritoneal band had become lengthened. She considered ventral fixation an unjustifiable operation before the menopause.

Dr. DOUGAL (Manchester) was in complete agreement with the President as regards the treatment of mobile backward displacements of the uterus. Recently, when looking up the subject of chronic backache in women, he had found that backward displacements were almost universally looked upon as the most frequent and important cause of this symptom and very high percentages of cures were claimed for operations which corrected the malposition. This was not borne out by his own investigations. In the group of cases classed under the headings of chronic endometritis and chronic metritis he had found backache almost as frequently complained of when the uterus was in a forward position. He was of opinion that in many of the cases of so-called uncomplicated retroversions and retroflexions there

was a certain amount of prolapse which was not taken account of and that the good results obtained from the various fixation and round ligament operations were due to the extra support given to the uterus. This view was supported by the fact that chronic backache was cured or very much relieved in a very high percentage of cases of prolapse treated by colporrhaphy although the uterus after operation still remained in a retroverted position.

Mr. W. W. KING (Sheffield) said that he only operated upon those cases of mobile retroversion in which the symptoms were relieved by replacement of the uterus and the use of a pessary. No woman objected to the use of a pessary for three months when it was pointed out that it was being used as a test as to the advisability or otherwise of operation. The use of this test eliminated the necessity for suspension operations in all but a very few cases. He considered that dyspareunia, sterility and repeated abortions were, of themselves, indications for operation. He related cases of the cure of symptoms by sling suspension operations and their recurrence when the round ligaments gave way, so that the uterus again became retroverted. He took this to prove that retroversion did sometimes cause symptoms. He rarely undertook the operation of curettage except as a diagnostic procedure or in cases of retained products of conception.

Dr. H. LEITH MURRAY (Liverpool): The discussion which the President has inaugurated is a most important one, and merits a statistical reply. The faith that is in me is best expressed by a record of the operations I have performed. I have, accordingly, analyzed the last three completed years (1921—23) of my work in the Hospital for Women. During that time I did 31 ventral suspensions of one kind or another for mobile displacements. The total operations during this time numbered 1,212, and of these 593 were abdominal operations. Of the 31 cases, 12 were cases of retroversion in nulliparous women. These appear to me to be particularly important because the complication of child bearing does not intrude. Of the 12 (*a*) nine were in married nulliparous women for the following indications: In seven for sterility, or sterility with dysmenorrhœa. The object of these operations was merely to produce a mechanical improvement in the position of the cervix. Four of the cases were thoroughly dilated in order to paralyze the cervix and thus obliterate uterine colic as a cause of the dysmenorrhœa. In one case the uterus was believed to be lightly fixed; the symptoms were menstrual ache and five years' sterility. No adhesions were found, and the uterus was suspended for the same reason as in the preceding case. In one case complaining of menorrhagia and dysmenorrhœa since marriage, a curettage was also carried out. I cannot justify the suspension in this case, and as a matter of fact I would not now do it.

(*b*) Three suspensory operations were carried out in single women, and were decided on after exploration; two were diagnosed as mild inflammatory disease, and although adhesions were absent, the congestion of the tubes strongly suggested that these cases were of this nature. The third was a case of dysmenorrhœa of three years' standing, in a woman aged 22, who had already been curetted elsewhere without relief. General symptoms, *e.g.*, cold hands, seemed to predominate, and I had some doubt as to whether I was justified in my procedure. The after-history of this case was particularly enquired into, and the last report, received two and a half years after the operation, was to the effect that the patient had "kept very well since

the operation which had benefited her very much." During these three years I did no suspensory operation in private on any nulliparous woman.

It will be observed, therefore, that I am in complete agreement with the President that there is little need for suspensory operations in nulliparous women. At the same time I must point out that during the period analyzed I did no curetting on any single woman, and only the one, above mentioned, in a nulliparous woman. I do not think that I am unduly enlarging the scope of this discussion by comparing this record with the series of 33 curetted cases tabled by the President, of whom 22 were nulliparous or single women. With such a diversity of opinion it would appear that a discussion might profitably be inaugurated on the scope of curetting for these cases.

There are exceptions that prove every rule, and I admit that I have met a very few cases of single or nulliparous married women where excessive cyclical loss and a heavy uterus, not by any means necessarily retroposed, seemed to merit a curettage. Although I cannot prove it, I feel convinced that these are cases of gonococcal uterine infection. Apart from these exceptional cases, and apart from puberty loss, I venture to suggest that cases of excessive menstrual loss in single or nulliparous women are largely cases of functional hyperactivity, due to the woman's emotions, and I doubt whether local treatment is indicated. How many of the President's cases, I wonder, showed obvious signs of undue loss?

For the other symptoms quoted by the President in his case-histories, namely, dysmenorrhœa and sterility, I see no need for curetting. The great bulk of cases of uterine colic can be cured by paralyzing the cervix, and an enlargement posteriorly of the external os is of distinct use in relieving sterility in cases where the os is pointing anteriorly. Dysmenorrhœa and sterility are, in my experience, the main symptoms requiring attention in nulliparous women, and I find that in the latter there is a distinct tendency to exaggerate other symptoms such as monthly loss or leucorrhœa—apparently in an endeavour to explain sterility. I note that, in the President's analysis of the 13 nulliparous women, five had been married for two or more years, and were sterile.

I doubt, too, the merit of curettage of the uterus for leucorrhœa in single or nulliparous women. In the majority of these, as can readily be confirmed by the microscope, the leucorrhœa consists of a mass of squamous epithelium. No doubt this desquamation is being washed down by mucus from the cervix, and it may be that, in some cases, curettage of the cervix will help (although unappreciably in my own experience); but I cannot see that a curettage of the body can ever help such a condition. I should like to have had from the President further particulars of the constitution of the leucorrhœas he describes in his cases.

With regard to multiparous women, I readily admit that I find much difficulty in appraising the more usual complications of child-bearing—subinvolution, mild appendage disease, and slight descent—in their relation to symptoms. I am, like the President, absolutely convinced that in mobile retrodisplacements, hyperæmia is intrinsic and is not determined by the backward position. In cases judged to be uncomplicated prolapse associated with retroversion, I consider there is no need to do an abdominal operation. The cause of the intrinsic hyperæmia, when it occurs, appears in the great majority of cases, to be subinvolution, and a thorough curettage is the best treatment, provided that the case is not an aggravated one. By

aggravation, I mean that the uterus is so soft that it fails to maintain its normal outline—in other words, it is not only retroverted, but has become retroflexed. Here I differ from the President by indulging in some form of suspensory operation plus curettage. I am not in a position to compare results (which the after-histories prove to be good) with his; this must always be the case, where, of two operators, one does a more extensive operation with good results in any type of case. I would be very glad to know that a bad case of subinvolution with retroflexion can be effectively treated by the curette alone, but the President has not elaborated his cases in that direction, and includes all backward displacements under one heading. I am not contradicting myself in any way when I suggest that uterine hyperæmia, due to an intrinsic cause such as subinvolution, can best, *and most quickly* be improved in cases of retroflexion by a suspensory operation (in addition to the curettage which I invariably adopt).

Many of these cases are undoubtedly complicated by some degree of prolapse, but prolapse with a retroposed and enlarged uterus is prolapse complicated by subinvolution, and this latter requires independent treatment.

My cases of suspensory operations for mobile retrodisplacements in multiparous women during the three years analyzed, total 19, and comprise :

Seven cases of retroflexion with subinvolution treated by suspension plus curettage, together with a moderate plastic operation. I believe that any case which shows a postural element in the symptoms, *i.e.*, relief is experienced when in bed, should have the vagina columnized by colporrhaphies. To my mind the symptoms of vaginal prolapse are evident less in proportion to the obvious degree of prolapse than to the rate at which it is occurring, and it is well to err on the safe side by strengthening the pelvic floor where the indication of postural relief is present. The President brings in the sympathetic system as a possible factor in some cases in relation to the good effects resulting from the use of pessaries. May it not be that these are cases of early vaginal prolapse where the symptoms bear more relation to the rate than to the obvious degree? My own experience would lead me to believe so.

One case of abdominal suspension with curettage alone for retroflexion with subinvolution, and

Eleven cases of retroversion where definite flexion was not present. Four of these were cases requiring a plastic operation, and where the uterus was big, soft, and tender, that is to say, there was very definite subinvolution (for which curetting was done), but where flexion had not occurred. Three were cases requiring a plastic operation and with symptoms suggesting appendage disease (one proving to be chronic appendicitis), but where the appendages showed no abnormality; it may be that in the last two a plastic operation with curettage would have been sufficient. Two were cases of dyspareunia as the main symptom, and where, after a plastic operation, the uterus was slung up to raise the ovaries. Two were cases without postural symptoms, and believed before operation to be appendage disease, but where nothing was found within the abdomen. Here again perhaps a curettage would have been sufficient. Some explanation of my procedure in several of these cases lies in my objection to curetting a case presenting any suggestion of appendage disease, however mild.

It will be appreciated, then, that as regards suspensory operations I am broadly in agreement with the President, except in the case of serious

subinvolution with retrodisplacement, but that, as regards curettage of the body of the uterus in nulliparous woman, whether it be anteposed or retroposed, I am in marked opposition to him, and see very little need for it.

As to terminology, I prefer functional hyperactivity to "disordered action of the uterus," and in most cases subinvolution to "endometritis."

Mr. CARLTON OLDFIELD (Leeds) said he had been greatly interested in the subject for many years, and for the last ten years or more had believed and taught that retroflexion and retroversion did not *per se* produce any symptoms whatsoever. He regarded retroflexion as a normal variation of the position of the uterus. Therefore he cordially agreed with Dr. Donald's first two conclusions, viz.:—(1) That when symptoms occurred in cases of retroflexion they were due to complications; (2) That such complications were not caused by the retroflexion. These propositions bore great weight when stated by such an authority as Dr. Donald, for whose opinions we all had great respect. Mr. Oldfield regretted that Dr. Donald said that retroflexion sometimes appeared to cause pain and nervous symptoms. It seemed to him (the speaker) that this statement was not in accord with the first two conclusions. Mr. Oldfield also thought that Dr. Donald had confused the issue by dragging into the discussion endometritis and metritis in association with retroflexion, for while no doubt they often occurred with retroflexion, they were much commoner in cases where the uterus was lying in the anterior position and had no more to do with retroflexion than salpingitis or other organic disease in the pelvis, and that Dr. Donald had really expressed the same opinion in his first two conclusions.

Mr. Oldfield hoped the Society would give a lead to the profession in this important question, for he thought there was no doubt that much harm resulted from the use of pessaries in the treatment of cases in which the uterus happened to be retroflexed and many unnecessary operations were performed upon such cases.

Mr. MILES H. PHILLIPS (Sheffield) who regretted his inability to be present and take part in this discussion had asked Dr. John Chisholm to express the following views on his behalf:—

He was in agreement with Dr. Donald that the chief symptom of mobile retroversion is (1) pelvic discomfort, varying in amount, and even in the same patient at different times. If neglected, frequently neurasthenia follows. The other troubles are (2) sterility, (3) liability to abortion, and (4) dyspareunia, more especially when the ovaries are prolapsed. All these symptoms, if uncomplicated by other conditions, can be cured by replacement of the uterus, and its retention by a pessary or suspension operation. Mr. Phillips was astonished that cases of this kind occur so rarely in Dr. Donald's practice. The retroversion, however, is often of much less importance than some other conditions also present, for example: (1) gonococcal or other infection of the cervix, endometrium, myometrium, or appendages; (2) Vaginal prolapse; (3) Hypertrophied vaginal cervix. To overlook these, and attend only to the retroversion, is a frequent cause of disappointment. Often it is easy to tell what degree of attention the retroversion requires in the inflammatory cases. But, in others, a pessary is first employed after replacement as a test before operation is advised. Mr. Phillips is satisfied that a retroversion does not cause endometritis. This is a statement made by people who look upon any condition of hyperplasia as being caused by endometritis. Mr. Phillips believes that congestion of

the cervix and body of the uterus are produced by retroversion in many but not in all cases. This depends on the tone in the broad ligament and utero-sacral folds.

Mr. Phillips was very astonished that Dr. Donald had overlooked the paper by the late Sir William Japp Sinclair on the engorgement and erosion of the posterior lip of the cervix in retroflexion. Mr. Phillips has on many occasions demonstrated that this disappears after the uterus has been put in its proper position. This must point to some interference with the circulation.

Again drainage is interfered with by a retroversion in the puerperium and occasional cases of lochiametra result. In these the benefit of the semi-prone position for an hour or two or even longer in bad cases before the retroverted uterus can be reduced is often seen.

Mr. Phillips knows of three cases of acute abdominal pain produced by the retroverted uterus being caught and held by the utero-sacral folds. In two of the cases the surgeon at the operation (abdominal section) had considerable difficulty in dislodging the fundus although there were no adhesions. In one of these cases the patient was a young nurse who was lifting a heavy bed.

Dr. FLETCHER SHAW (Manchester) said his views on this subject exactly coincided with those of Dr. Donald, and as he had, on two previous occasions, collaborated with him in papers upon this subject there seemed no object in further reiterating his views, but it might be useful if he gave the reasons for his convictions.

As a student he was taught that retroflexion was a definite pathological condition which produced symptoms and must be treated by ventral fixation; but a few years later, when Resident Surgical Officer at St. Mary's Hospital, he worked for several years under two chiefs who strongly upheld diametrically opposed views on this subject.

In one ward ventral fixation was hardly ever done and women complaining of menorrhagia, dysmenorrhœa, chronic pain in the back, sterility, etc., in which no other lesion was found in the pelvis were treated by curetting whether the uterus was anteflexed or retroflexed, while in the other ward these patients, with the same symptoms, were divided into two groups, and those with retroflexed uteri treated by ventral fixation.

It is quite possible that a young resident, working under either of these chiefs alone, would have absorbed his views without much thought, but no thinking man could work under these two strong personalities at the same time without making an effort to prove which was right. Both were dealing with the same class of case but treating it on fundamentally different principles, so the simplest way of getting at the truth seemed to be to take a consecutive series from each ward and compare the results. Unfortunately one chief vetoed this, but the other gave him a free hand to do as he liked and he made full use of this permission.

In the first place he took a consecutive series of patients who had been curetted for these symptoms, hæmorrhage, dysmenorrhœa, chronic pain, sterility, frequent abortion, leucorrhœa, etc., irrespective of whether the uterus was anteflexed or retroflexed. These cases were tabulated according to their symptoms and a questionnaire sent to each asking for the result of the operation as applied to each symptom separately, as well as the general statement of whether she felt better on the whole. He had definite replies from 172, of whom about 85 per cent. stated they were cured or

definitely improved. He then divided these into two classes and noted the results under each heading in these two classes.

All these patients had been treated by curetting and 85 per cent. expressed themselves as cured, but the retroflexed uteri had been left in the position of retroflexion and so if this position was the cause of the symptoms this group could not be cured by curetting, whereas if the symptoms in both classes were due to some other common pathological condition which curetting cured, then the results in the retroflexed group could be as good as in the anteflexed group. On every point, general result, hæmorrhage, dysmenorrhœa, leucorrhœa, chronic pain, even sterility and repeated abortions, the group of retroflexed uteri gave a slightly higher percentage of cures than the anteflexed uteri. Could he, after this investigation, be otherwise than a firm believer that the position of the uterus had nothing whatever to do with the production of these symptoms?

He did not wish to burden the discussion with figures, but if anyone was interested in the details the figures would be found in an article by Dr. Donald and himself in the *Practitioner*, June, 1913. That was many years ago, and he had never had any reason to alter his views. The only criticism he could discover against these figures was that this group of cases was for some reason or other more favourable to these views than another group would be.

To answer this self-made criticism he had recently investigated all the cases he had curetted for these symptoms in the years 1920-21. These dates are sufficiently remote to eliminate the temporary cures, though, unfortunately, it greatly diminishes the number of replies received from hospital cases, and this tends to lower the percentage of cures, as a patient with an unsatisfactory result is more likely to answer and ask for further treatment than one who is cured but her gratitude somewhat diminished by time. He had replies from 163 patients, of whom 78.5 per cent. expressed themselves as cured or much improved. In a few instances the position of the uterus was not recorded, and he found this series contained 107 patients with anteflexed uteri and 39 with retroflexed uteri. The general results in the anteflexed uteri were 75.7 per cent. cured and in the retroflexed uteri 82 per cent. cured.

This second investigation completely confirmed the previous one and still further strengthened his belief that a mobile retroflexion does not produce symptoms. Some of the opinions expressed in the discussion might seem as the poles apart from Dr. Donald's views, but was this really so? Dr. Donald made the general statement that mobile retroflexion did not produce symptoms, but he carefully said that retroflexion, like everything else in medicine, was subject to exceptions, and there were a few cases, very few in his own opinion, in which the position of the uterus did seem to produce symptoms, and in these cases if the simple method of treatment, curetting, failed he said some fixation operation should be tried. What Dr. Donald wished to destroy was the old teaching that retroflexion was the cause of all pelvic symptoms of which that patient complained and that treatment should be directed in a routine way to the position of the uterus. This was the old teaching and, unfortunately, still the attitude of many gynæcologists, especially of surgeons with a leaning to gynæcology, and it was this teaching which accounted for the very large numbers of unnecessary fixations which were still done all over the country. Dr. Donald made the general statement that retroflexion did not usually produce

symptoms but he allowed exceptions, and it seemed to him that many of the speakers who apparently supported ventral fixation were really arguing from these exceptions, as their own figures proved they very seldom performed this operation for a simple mobile retroflexion.

Dr. DONALD, in replying, said that he had already dealt with the pertinent criticisms in the body of his paper. Some of the speakers had evaded the main point at issue—namely the significance of retroversion and the criticisms of the congestion theory. The discussion showed that the feeling was against the indiscriminate performance of suspension operation.

Meeting held at Manchester on Friday, December 19, 1924. The President, Prof. A. DONALD, in the Chair.

Three new members were elected.

Dr. FLETCHER SHAW (Manchester) showed an Adenomyoma of the recto-vaginal space with recurrent polypi in the vagina. (See page 118 in this number of the Journal.)

Dr. K. V. BAILEY (Manchester) read a paper on The pathology of ectopic Müllerianoma (pelvic adenomyomata) which appeared in the Winter Number of this Journal (p. 539).

Miss FRANCES IVENS (Liverpool) showed an Endometrio-myoma of the posterior uterine wall, the report of which will appear in a forthcoming number of this Journal.

Professor BLAIR BELL (Liverpool) described a case, and showed histological sections, of endometriomyoma of the round uterine muscle (ligament) which had been found adhering to the fundus of a hernial sac removed at operation in the Royal Infirmary, Liverpool, by Mr. Frank Jeans, from a married but nulliparous woman, forty-seven years of age.

The tumour was the size of a hazel nut; it was of firm consistence and was contained in a definite capsule. On histological examination the tumour was found to be a typical endometriomyoma.

As this case conclusively supported the view of Professor Blair Bell concerning the possibility of congenital displacement of an endometrial anlage in the course of the muscular development of the uterus, a fuller account will be published later.

Dr. W. E. FOTHERGILL (Manchester) reported a case of

TARRY OVARIAN CYSTS WITH CANCER IN THE POUCH OF DOUGLAS.

The doctor who sent this case to me regarded it as one of malignant new growth behind the uterus. It had already been ascertained by curetting and examination of the scrapings that the endometrium was not cancerous. On admission the condition was as follows: MRS. A. P., aged 37, had two normal pregnancies, the last nine years ago. Menstruation began at 14 years of age, regular, 28 days, 5 days. During the last four months the duration of the periods lengthened, the quantity of the discharge increased and clots were passed, but there was no menstrual pain. There was much sacral pain during the last three months, with weakness, loss of appetite and loss of weight. Constipation was troublesome. There was some slimy discharge passed with the fæces, but there was no bleeding from the rectum.

Abdominal examination revealed diffused resistance on deep palpation above the pubic symphysis. On vaginal examination, the cervix was well

forward, fixed, and large in size. The uterine body was felt in front of the cervix, bulky and very slightly movable. Behind the cervix was a firm, rounded solid mass, and both sides of the pelvis were felt to be occupied by dense masses too fixed to permit of satisfactory bimanual examination. The central mass behind the uterus bulged into the rectum; but careful investigation revealed no lesion of the rectal mucosa; and the rectal canal, though flattened, was not occluded.

The abdomen was opened on October 11th, and, after separating adhesions, the uterus, which was almost twice the normal size, was seen to be in front. On the right, buried in adhesions, was an ovarian cyst about the size of a golf ball from which chocolate-coloured treacly material escaped when it burst. On the left, also densely adherent, was a tarry cyst as large as a small cocoanut. The body of the uterus, the two tarry cysts and the tubes were removed with some difficulty. The adhesions behind the cervix completely obliterated the pouch of Douglas; while between the cervix and the rectum a firm, fixed mass, about the size of a hen's egg, could be felt. This could not be approached with any prospect of success. If it was cancerous, its fixation showed that the condition was too advanced for operative treatment. If it was an endometrioma, together with inflammatory exudate, it could be left *in situ* with considerable prospect that it would cause no further trouble. The abdomen was therefore closed.

Convalescence was without event for a fortnight. The sutures and the dressing were removed on the thirteenth day, the wound being well healed. Subsequently the pulse-rate increased and on the nineteenth day there was pain in the left leg. This became enormously swelled, and later the right leg was affected. The temperature remained normal; the pulse-rate varied between 88 and 108. The patient's condition gradually became worse, and she died on the twenty-third day after the operation. At the autopsy the peritoneal cavity was found normal and the operation area well healed. The uterine cervix was removed together with the rectum, the egg-sized mass lying between them; the greater part of the vagina being also excised. There was organized blood clot in the left external iliac vein; the lower end of this clot extended beyond reach. The thrombosis extended up through the common iliac vein into the inferior vena cava.

A sagittal section through the cervix, the recto-vaginal septum and the rectum showed a firm whitish mass about the size of a hen's egg sharply defined from the rectum behind but less clearly demarcked from the cervix and vagina in front, for it was seen to be invading the supra-vaginal cervix and breaking through the vagina towards the posterior vaginal fornix. Careful examination failed to reveal any lesion within the rectum which was congested and lined by thick mucus. Microscopic examination confirmed the observation that the rectal wall was normal. The mass in contact with but sharply defined from it was an adeno-carcinoma, not very glandular in structure and containing a considerable quantity of skeletal structure. Sections of the cervix showed the cervical mucosa to be normal; but the outer and posterior portion of the cervix contains near its surface areas of the tissue known as adenomyoma or endometrioma. Microscopic examination of the body of the uterus showed no abnormality.

Is this a case of malignant change in an endometrioma of the recto-vaginal septum? The specimens are shown in order to obtain the opinion of members of the Society on this point. Malignant change in endometriomatous tissue is said to be very rare. Is it possible that the left ovary

contained a carcinomatous portion and also an endometriomatous portion which produced the large tarry cyst, while the malignant portion became sequestrated in the floor of the pouch of Douglas and invaded the recto-vaginal septum?

Dr. J. W. A. HUNTER (Manchester) had little to add to the remarks made by Dr. Fothergill in this case. The case was a typical one of bilateral tarry ovarian cysts, both very adherent to the posterior surface of the uterus and broad ligaments, the rectum being adherent to the posterior surface of the isthmus uteri and cervix and with a palpable mass, the size of a hen's egg, in the rectovaginal septum.

The specimen removed showed the ordinary subinvoluted type of uterus with walls about $\frac{3}{4}$ inch thick, the endometrium being hypertrophied and showing hyperplastic interstitial endometritis of the diffuse fungus type. Many sections of the uterine wall failed to reveal any adenomyomatous tissue. The tarry cysts in each case were formed in a space bounded anteriorly by the anterior layer of broad ligament and flattened-out ovary, and posteriorly by the posterior layer of broad ligament. One contained about ten ounces of tarry fluid and the other one ounce.

The specimen removed post-mortem and consisting of rectum, vagina and cervical stump revealed a hard white tumour mass about the size of a hen's egg situated between the cervix and vagina in front, and rectum behind. It was clearly defined with no sign of ulceration into the rectum, cervix or posterior fornix. Microscopic sections of the growth revealed an adeno-carcinoma of the sclerosis type definitely separated from the rectum by the thickened deeper layers of the rectal wall. Section through the cervix and what appeared to be malignant growth in the deeper parts of the cervix showed normal cervical mucosa with adenomatous deposits similar to those seen in cases of adenomyoma of the recto-vaginal septum.

It was considered probable that the carcinoma had arisen from malignant change in a previously existing adenomyoma of the recto-vaginal septum. One striking point in the case was the absence of any clinical history such as is usually found in cases of tarry cysts, the symptoms having only been those due to the malignant growth.

THE ROYAL ACADEMY OF MEDICINE IN IRELAND.

A Meeting of the Section of Obstetrics of the Royal Academy of Medicine in Ireland was held in the Royal College of Physicians on Friday, Nov. 28th, 1924, the President, Dr. L. CASSIDY in the Chair.

The Master of the Rotunda showed specimens from three cases of Malignant disease of the genital organs, with direct extensions into the intestinal tract. These three specimens were of interest from the definitely gynæcological origin of the growths and the relatively simple symptoms which suggested uncomplicated gynæcological conditions. The only one in which any trouble outside the genital organs was to be expected was the first and in it the operation decided upon was for the purpose of dealing with the possible extensions of the disease. The other two cases had serious extensions which called for further abdominal surgery, but the actual nature of the growths was not established for some days after the operations were completed.

The PRESIDENT referred to the rarity of primary cancer of the vagina, and said that he thought Dr. FitzGibbon and Mr. Seton Pringle were to be congratulated on the excellent way in which they had dealt with this case, which must have been an extremely difficult one.

Regarding the second case, when a woman of 50 suffered from regular hæmorrhage, and possibly a fibroid, he thought it certainly suggested cancer of the body of the uterus, and he thought that usually on clinical grounds this diagnosis could be made, without doing a primary curettage. The condition found in Dr. FitzGibbon's third case was also a rare one.

Dr. R. J. ROWLETTE said that judging by the slide which he had seen of Dr. FitzGibbon's first case, and also by the history, it was not a case of which one would take at once to be carcinoma, as it might be taken to be a far advanced papilloma. He thought it was more likely that the condition was a secondary implantation of papilloma than that it was primary cancer. During the time he worked in the Rotunda Hosital in fifteen years they had only had about three cases of vaginal cancer.

Dr. FITZGIBBON replied.

Dr. BETHEL SOLOMONS read an abstract of a paper written by him and Professor Bronte Gatenby on the Formation, structure and physiology of the corpus luteum of man, the pig and the duck-billed platypus. (The complete paper appeared in the Winter number of this Journal, p. 580.) Having dealt with the historical aspect, the theories as to the formation of the corpus luteum were discussed, and the conclusions arrived at by the essayists pointed indubitably to the fact that the membrana granulosa layer was the responsible factor in formation. The authors had investigated the action of liquor folliculi when given by mouth to humans and to rats. In the former it was tried for the hæmorrhage of puberty, adult life and the climacteric; also for menopausal symptoms. It was without effect in all these conditions. Probably the hormone is destroyed by the digestive juices. Later, it will be tried hypodermically. On rats it had a great effect, and these experiments were intended to run parallel with those of Allen and Doisy, but the rats were fed instead of being injected. Generally speaking, the ovariotomized rats were affected sexually, and control animals who were not given the liquor were not affected: these investigations are not yet complete. Corpus luteum when given by the mouth is useful in the treatment of scanty and absent menstruation. It is a valuable aid in the treatment of sterility, but of little service for menorrhagia and metrorrhagia. It is occasionally helpful in treating dysmenorrhœa. Menopausal symptoms are seldom relieved. It is successful in some cases of vomiting of pregnancy. When administered hypodermically it has cured some cases of severe vomiting and menstrual epilepsy. It is difficult to understand why corpus luteum administered by the mouth or hypodermically should cure amenorrhœa, considering its physiological action: this point requires intestine investigation by the physiologist in combination with the gynæcologist. Theoretical explanations are either that the drug stimulates the ovary to action, or that the corpus luteum after administration acts in the same manner as the true corpus luteum. In the same way it is difficult to understand why corpus luteum given all through pregnancy should help in preventing stillbirths, which usually occur in the last two months. Possibly it produces a healthy corpus luteum which supplies the hormone necessary to the child from the seventh month onwards.

Abstract from Obstetrical Section of Royal Academy of Medicine.

Professor J. Bronte Gatenby showed a number of lantern slides illustrating the formation of the corpus luteum in the human, pig and duck-billed platypus. The theca interna elements in all these animals preserve their integrity until regression of the corpus luteum sets in, so that the corpus luteum cells are really of single origin from the membrana granulosa. The corpus luteum of pregnancy is not always larger than that of menstruation. The presence or absence of fatty substances constitute no sort of index as to pregnancy or not. The theories of the action of the liquor folliculi and corpus luteum were discussed.

Professor H. PRINGLE said that he did not agree with Professor Gatenby in saying that the luteal cells originated only from the granulosa cells. He believed that the granulosa and interstitial cells originated from the luteal cells. If they had two separate origins one would expect two specific hormones. There were three separate hormones: (1) The hormone of the interstitial tissue; (2) The hormone of the Graafian follicle, and (3) The hormone of the corpus luteum, and this hormone seemed to antagonize the second hormone. The observations which they had heard that evening from Dr. Solomons and Professor Gatenby seemed to be absolutely incompatible with this hypothesis. One of the most interesting features about the question of the effect of corpus luteum on stimulating ovulation was in cases where ovulation only followed coition. If a rabbit was allowed sterile coition, the corpus luteum following this was practically identical with the corpus luteum following pregnancy, and the corpus luteum persisted practically as long as if the corpus luteum ovum had been implanted. When the abdomen was opened, and the surface of the ovary was follicized, one introduced a factor which might be in every way compatible with sterile coition. It seemed to him that the whole question was still in a very unsatisfactory state, although Professor Gatenby had added enormously to the knowledge which they had concerning the physiological changes which occurred in the corpus luteum.

Professor J. M. O'CONNOR referred to the fact that physiology had developed greatly during the last century, and that it was now divided into two parts, one the movements of the body, and the other the development of the body. Attention was now given almost altogether to the mechanical stage of the body. Zoologists deal with the actual living animals, and gynæcologists could not avoid studying them. The question of internal secretion, however, also had to be considered; he personally had no doubt that internal secretion was a genuine thing, and people had to be alive to its possibilities, but there was always a tendency to scepticism on this subject. He was very struck with the hormone therapy which had been referred to in the paper they had heard that evening; some results were given which it would be impossible to put down to physiological effects. He was interested in the statement that there was no interstitial tissue present in the ovary, as he had been led to believe that interstitial tissue was the most important thing that was present in the ovary.

Dr. W. FEARON said that when thinking of internal secretions one had to go back to the French observers. The first typical hormone had been isolated about 1902 and was called secretin. The bodies of the hormones were of simple structure, and were just simple molecules, derived from well-known amido acids, and that was why it was so important that these

acids should be in the body, as they helped the internal secretion. There were also internal secretions which so far no formula had been produced for, such as insulin, but the internal secretions which carried out the simple functions of the body were simple substances. Hormones could be divided into two parts, those of simple molecular structure, and those of ill-defined structure. He asked if corpus luteum could be given to all species, or if it must only be given to one species.

Dr. W. W. CROFTON said that he had given internal secretions by the mouth in some cases, and had got physiological results. He had also tried multiglandular preparations in some cases, and had found them of great benefit. He wondered why the corpus luteum of pregnancy was so much larger, if the fœtus was to survive in the uterus. He thought that nervous mechanism had an important synchronizing effect. If extracts of fresh glands were given before they were frozen, they were much more powerful.

Dr. BETHEL SOLOMONS in reply said that some of the speakers had mistaken his views with regard to pluri-glandular therapy. Before the menopause he had found mixed gland preparations useless, and never prescribed them. At the menopause he did not order them often but there were some patients who benefited by a mixed gland tablet which contained suprarenal gland, ovarian substance with corpus luteum, a little pituitary and thyroid extract. He did not consider this was a random shot; on the contrary it was especially prescribed when the patient had symptoms suggestive of faults in the glands mentioned. While he had spoken of the possibility of trying luteum in the toxæmias of pregnancy, he did not intend to convey any idea that he would cease the proved successful methods of the Dublin school of midwifery.